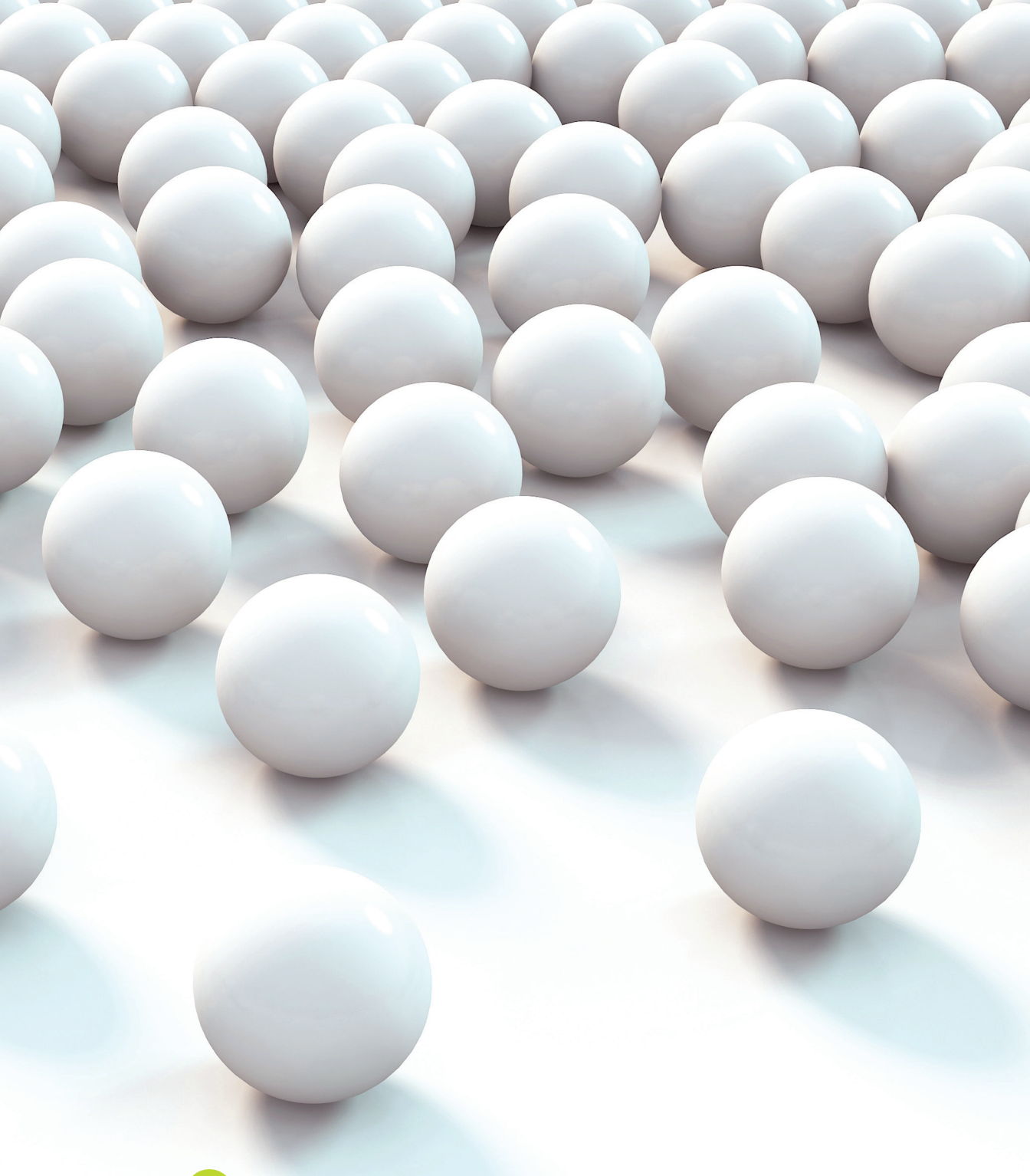


Bangs Laboratories, Inc.

PRODUCT CATALOG

1988 30 YEARS 2018

• BEADS ABOVE THE REST •

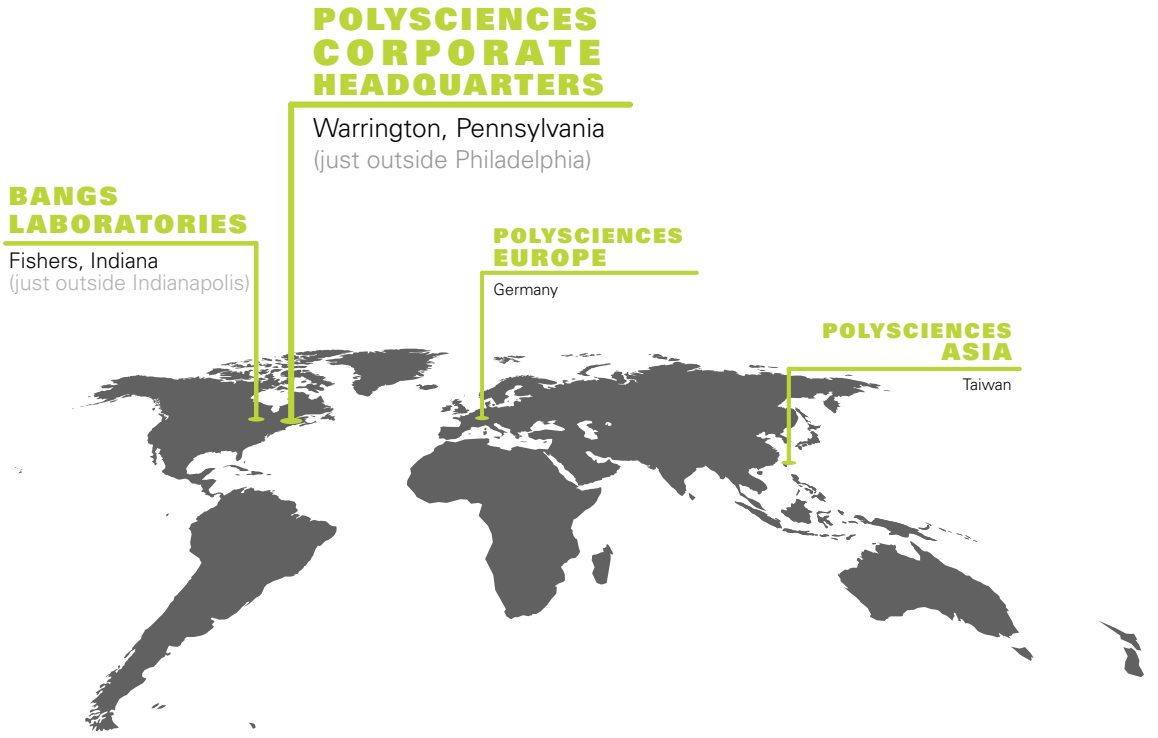
THANK YOU

Bangs Laboratories' 30 years of experience in microsphere synthesis and fine particle analysis have established us as a leading manufacturer of polymer, silica and magnetic microspheres to diagnostic companies and instrument manufacturers. We understand what it takes to get new assays and instruments to market, and we have the products and the know-how to support you in your development process. We manufacture at scales that will carry you from R&D through production, and under an ISO 13485:2016 Quality System that will meet your regulatory needs. Our dyeing, coating and surface modification capabilities are demonstrated in our specialty products for bioseparations and instrument standardization, and we are also pleased to offer custom formulations, concentrations, and packaging.

Give us a call and let us put our decades of real-world experience to work for you!

CORPORATE LOCATIONS

Bangs is a wholly owned subsidiary of Polysciences, Inc. Through our corporate locations around the world, we are prepared to meet your global needs.



Bangs Laboratories, Inc.
9025 Technology Drive
Fishers, IN 46038
info@bangslabs.com

Polysciences, Inc.
400 Valley Road
Warrington, PA 18976
info@polysciences.com

Polysciences Europe GmbH
Badener Str. 13
69493 Hirschberg an der Bergstrasse
GERMANY
info@polysciences.de

Polysciences Asia Pacific, Inc.
2F - 1, 207 DunHua N. Rd.
Taipei, TAIWAN 10595
info@polysciences.tw

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MICROSPHERE SELECTION

Microspheres offer a highly convenient and flexible system for developing reagents for assays and bioseparations, and for use as instrument standards. As there are many varieties of microspheres available, it is important to think about the demands the application will place on them when making a base bead selection. Physical and optical properties should be considered in the context of handling and detection, and thought should also be given to requirements for diameter and size distribution, composition, surface chemistry, and any other needed properties.

Size	Composition	Surface chemistry	Other properties
Diameter Uniformity / distribution	Density Refractive index Hydrophobicity / -philicity Nonspecific binding Autofluorescence	Reactive groups Level of functionalization Charge	Visible dye / fluorophore Superparamagnetic

DIAMETER

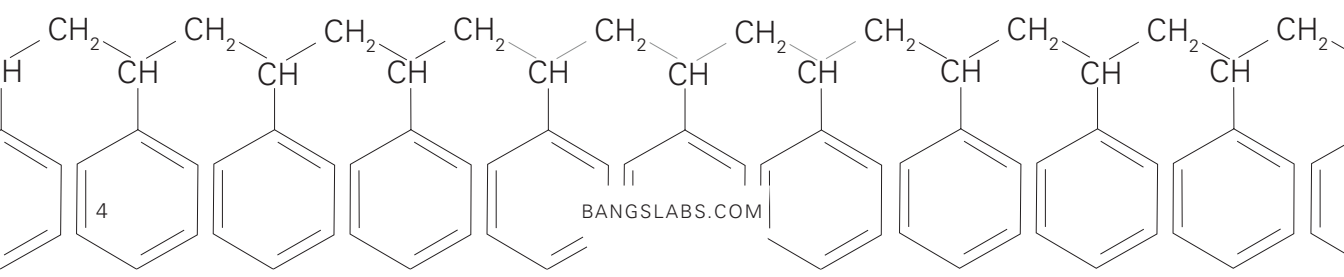
Microsphere size may be critical to the optimal performance of an assay, or it may be secondary to other characteristics. Considering traditional diagnostic methods, the test or assay format commonly dictates particle size, such as the use of very small spheres (~0.1 – 0.4µm) to ensure satisfactory wicking in lateral flow tests, or the use of larger, cell-sized spheres (~4 – 10µm) for bead-based flow cytometric assays. See application-specific TNs 301–305.

In magnetic separations, particularly those involving capture and elution of the target, the exact size of the magnetic particle may be unimportant provided that particles are in some general size range, and offer desired separation characteristics. See TN 102 and 102A, Magnetic Microspheres.

Diameter also determines surface area. Small-diameter spheres present more surface area per unit weight, while larger spheres present more surface area per bead. Size also affects ease of handling, processing considerations (such as the method used for separations [centrifugation, dialysis, filtration]), and the amount of ligand needed for coating.

COMPOSITION

Common microsphere compositions include polystyrene (PS), poly(methyl methacrylate) (PMMA) and silica. These materials possess different physical and optical properties, which may present advantages or limitations for different applications. See TSDs 0021 and 0022.



Polymer beads are generally hydrophobic, and as such, have high protein binding abilities. However, they also often require the use of some surfactant (e.g. 0.01 – 0.1% Tween® 20 or SDS) in the storage buffer to ensure ease of handling. During synthesis, functional monomers may be co-polymerized with styrene or methyl methacrylate to develop beads with surface reactive groups. Functional groups may be used in covalent binding reactions, and also aid in stabilizing the colloidal system.

Silica microspheres are inherently hydrophilic and negatively charged. Consequently, aqueous silica suspensions rarely require use of surfactants or other stabilizers. Carboxyl- and amine-functionalized silica spheres are available for use in common covalent coating protocols, and plain silica microspheres may be modified using a variety of silanes to generate functional groups or tailor surface properties.

SURFACE CHEMISTRY

Standard microsphere products support three basic coating strategies: adsorption, covalent coupling, and affinity binding. These methods are discussed in Microsphere Handling (page 10-11).

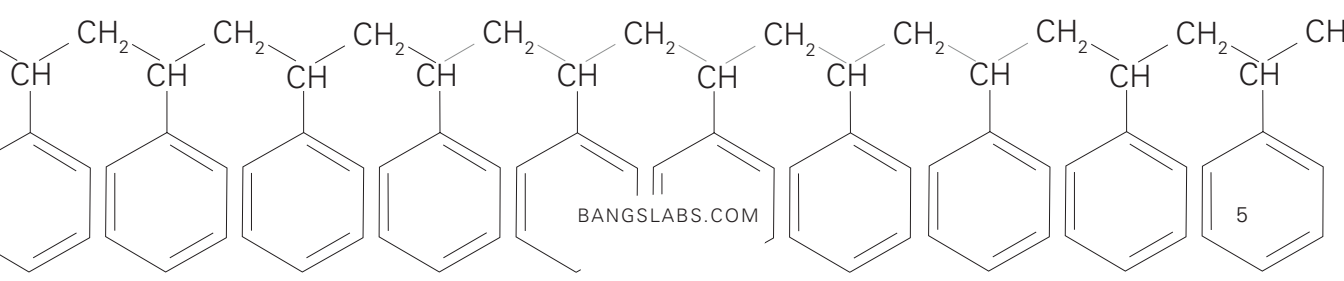
OTHER PROPERTIES

Many applications in the life sciences demand added traits, such as fluorescence or a visible color, or iron oxide inclusions for magnetic separations. Polymer spheres (and polymer-based magnetic spheres) may be internally dyed via an organic solvent swelling process, and many standard products are available. Many surface- or internally-labeled fluorescent beads are also available as specialized flow cytometry standards.

Various types of superparamagnetic microparticles are available—with different matrices, magnetite content, surface groups, etc. For new assays or applications, magnetic beads should be evaluated with application demands in mind.

COMPOSITION	**REFRACTIVE INDEX** (589nm)	**DENSITY** (g/cm^3)	**SOFTENING POINT** (°C)
PS	1.59	1.05	95
PMMA	1.49	1.19	105
Silica	1.43-1.46*	2.0*	>>1000

** Determined using representative samples. Other values are as reported in the literature for bulk polymer or silica.*



MICROSPHERE SELECTION

PRODUCT CLASSIFICATION SYSTEM

After 30 years in the microparticle business we have produced an extensive inventory that caters to a wide range of applications. Our product classification applies to our "general use" products (found in the Test Developer section of this catalog). The classifications are Lot-specific designations that are noted with active inventory on our website, and indicate the manufacturing level of the product. We anticipate that this framework will be of most help to manufacturers of commercial microparticle reagents. The product classifications are as follows:

I. Validated Products

Manufacturing process with documented evidence that the process consistently yields a product with results that meet predetermined specifications and quality attributes. Manufacturing processes have been validated through the ISO 13485 Design and Development process.

II. Standard Products

Manufacturing process yields a product with results that meet predetermined specifications and quality attributes. Products and processes are not validated but are capable of being reproduced. Material is produced with validated equipment and test methods under ISO 13485 guidelines.

III. Supported Research Products

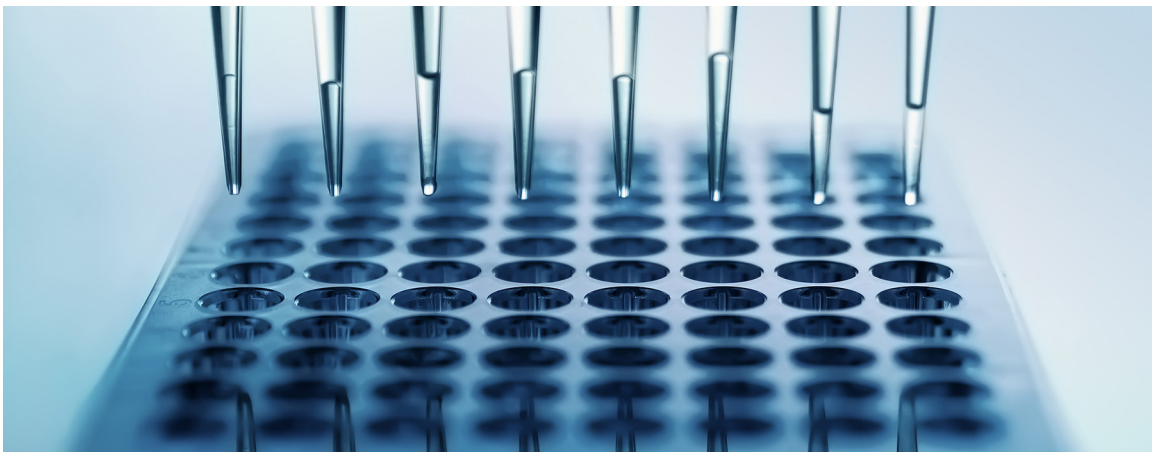
R&D manufacturing processes are conducted in accordance with established techniques, but may have some differences in formulation and/or the overall production process, as compared to Validated and Standard products. Manufacturing processes are documented, and may be repeated on a custom basis as needed.

IV. Unsupported Research Products

R&D manufacturing processes are conducted in accordance with established techniques, and these products have undergone basic characterization. Bangs has not made an effort to validate or reproduce the product.

DIAGNOSTIC APPLICATIONS

Test / Assay Format	Bead Size	Bead Type	Coating Strategy	Detection Strategy	Doc.
Turbidimetric (Automated LAT)	50nm – 500nm	Undyed	Covalent	Turbidimetry	TN304
Magnetic Chemiluminescence	1-5 µm	ProMag® HP	Covalent	Luminescence	PDS 743
Flow cytometric (suspension array)	2µm – 15µm	QuantumPlex™ or QuantumPlex™M (encoded populations for multiplexing) or Non-fluorescent (simplex or multiplex with different bead sizes)	Covalent or streptavidin / biotin	Flow cytometer	TN305
Bead "ELISA"	1-5 µm	ProMag®, ProMag® HP	Covalent	Spectrophotometer	TN303
Lateral Flow	0.1µm – 0.4µm	Dyed (visible or fluorescent)	Covalent or adsorption	Visual or automated reader (absorbance, fluorescence)	TN303
Lateral Flow – Boulders in the Stream	0.1µm – 0.4µm mobile phase	Dyed (visible) mobile phase	Covalent or adsorption	Visual	TN303
	~2µm – 3µm capture phase	Undyed capture beads			
Dipstick	0.1µm – 0.4µm	Dyed (visible)	Covalent or adsorption	Visual	TN303
Latex Agglutination Test (LAT)	0.2µm – 1.0µm	Undyed or visibly dyed	Covalent or adsorption	Visual (may be microscope-assisted)	TN201 TN301

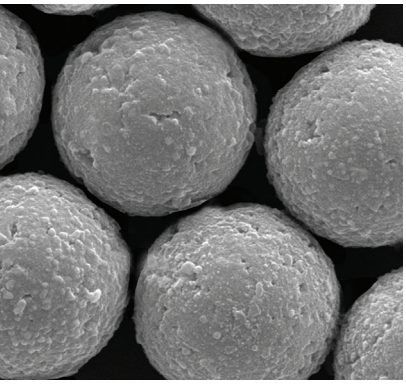


DIAGNOSTIC APPLICATIONS

TURBIDIMETRIC ASSAYS

Turbidimetric assays permit the rapid and quantitative assessment of critical medical conditions, and the development of particle-enhanced versions has been known to increase sensitivities by 10- to 100-fold.

We offer carboxylated and plain polystyrene ("latex") microspheres in the submicron diameters (0.05µm – 0.5µm) that are widely used for turbidimetric reagent development. The different surfaces support both covalent and adsorption protocols, allowing for the highly tailored coatings that are important to agglutination reactions. Additionally, our synthesis capabilities permit the manufacture of reproducible lots at the scales needed by OEM customers. See TN304, Light-Scattering Assays.



LATEX AGGLUTINATION TESTS (LATS)

In the classic LAT, beads are coated with antigen for the detection of antibody in serum or blood samples. If present, the antibody bridges antigen-coated microspheres, causing agglutination. Positive results are visually apparent as the homogeneous, milky white suspension takes on a grainy or sandy appearance. Undyed "white" spheres are often spotted on black cards, and dyed spheres may be applied to slides or white cards. See TN 301, Immunological Applications.

CHEMILUMINESCENCE ASSAYS

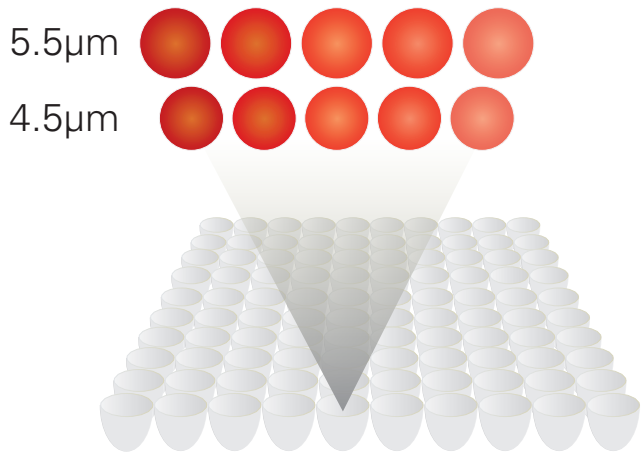
Chemiluminescent assays rely on the production of light by a chemical reaction rather than an external light source. Our ProMag® HP (High Performance) magnetic microspheres have been meticulously engineered for use in assay development. The highly optimized composition ensures lowest autosignal, particularly with respect to chemiluminescence and exposed iron. See PDS 743.

MAGNETIC PARTICLE ASSAYS

Magnetic microspheres confer a number of benefits, both in reagent manufacturing and assay performance. They present opportunities for automation, and offer easy and highly efficient separations. They are utilized extensively in traditional immunoassays, hybridization-based assays, molecular assays, gene sequencing, and proteomics. TNs 102 & 102A provide more details.

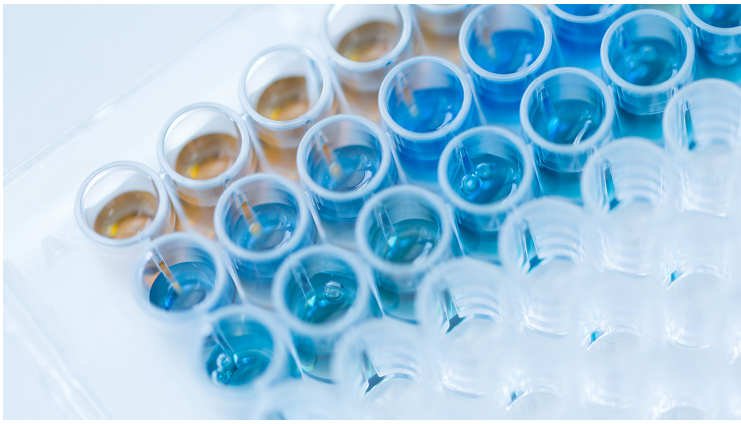
SUSPENSION ARRAYS

Suspension arrays for the flow cytometer feature populations of microspheres coated with different ligands for the interrogation of multiple targets within a single sample. Our QuantumPlex™ kits provide a general platform for multiplexed assay development on standard flow cytometers (488nm or 633nm Ex). Microsphere populations in 5-bead kits are encoded with different intensities of Starfire Red™, and the two size kits (4.4µm, 5.5µm) may be combined to extend the array. QuantumPlex™ M kits feature highly uniform 6µm magnetic microspheres. See TN 305, Suspension Arrays.



BEAD ELISAS

Bead-ELISAs have been developed using various types of microspheres, including micron-range polymer or magnetic microspheres or submicron polymer spheres. They offer increased surface area over traditional microplate ELISAs, and magnetic spheres, with their suitability for automation, can offer additional benefits with respect to reagent processing and assay performance. See TN 301, Immunological Applications.



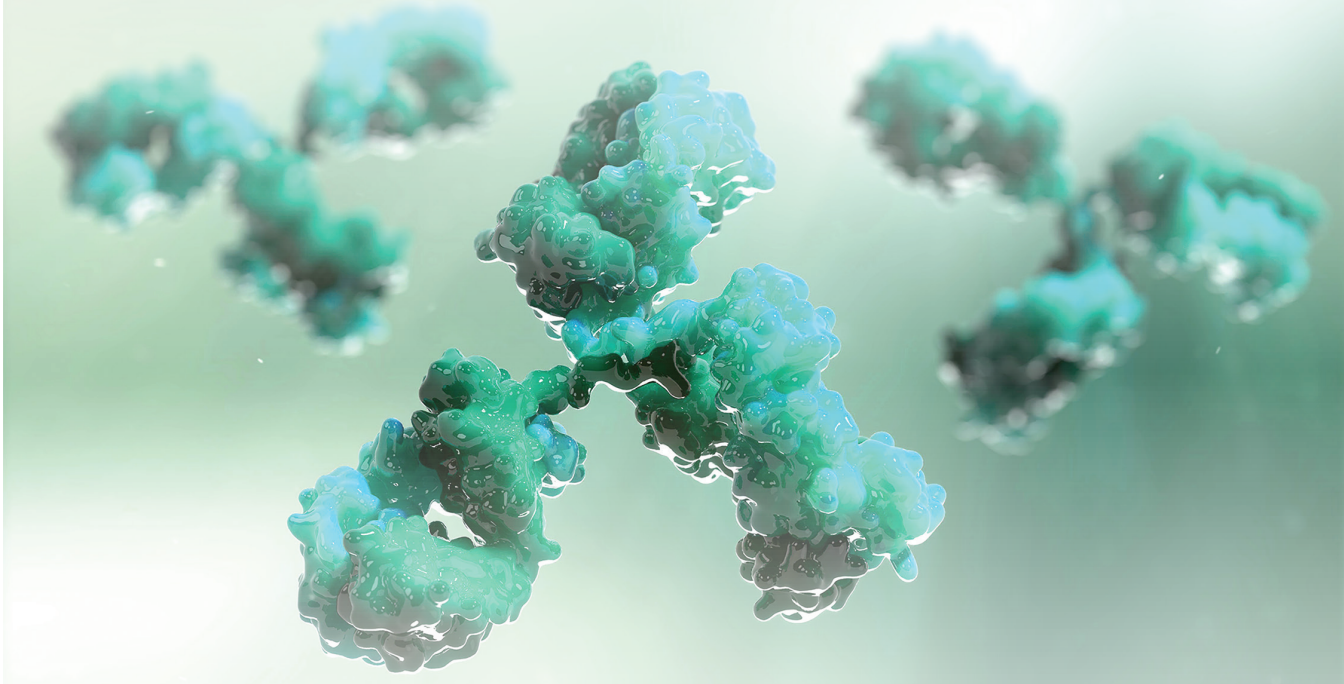
LATERAL FLOW TESTS

Dyed submicron microspheres are commonly used as the mobile phase in lateral flow tests. Vibrant colors permit visual detection of test results, and fluorescent versions such as europium chelate may be used with specialized readers. See TN 303, Lateral Flow Tests.

MICROSPHERE HANDLING

COATING

Microspheres are coated with ligands such as antibodies, oligonucleotides, peptides, etc. for use in diagnostics and bioseparations. Coatings are typically optimized to achieve desired specific activity while minimizing nonspecific interactions. Consideration should also be given to required stability, development time frame and budget, and the specific biomolecule to be coated. These factors will aid in determining the most fitting coating strategy for both short- and long-term objectives.



Adsorption

Adsorption relies primarily on hydrophobic interactions between the biomolecule and the polymer particle. Such coatings are fairly simple to conduct, involving incubation of the microspheres with the purified ligand. They typically require little optimization, and reagents may be developed relatively quickly. However, as adsorption relies on the formation of multiple attachment points between the ligand and particle, this strategy is typically reserved for use with proteins and non-functionalized polymer spheres. Adsorption is generally not suitable for hormones, peptides or nucleic acids in hybridization-based applications, and protein adsorption to silica is expected to be less efficient than to polymer. The use of microspheres with adsorbed protein coatings is often limited to formats featuring dry reagents (e.g. lateral flow tests where beads are dried on the membrane), rather than quantitative assays with suspended reagents. See TN 201, Working with Microspheres, and 204, Adsorption to Microspheres.

Covalent Coupling

Covalent coupling results in permanent attachment of the molecule to functionalized (e.g. carboxyl or amine) microspheres. It can provide needed stability when developing a commercial reagent, and for multiplexed assays, where analyte-specific bead populations are mixed. Additionally, specialized chemical linkers may be employed to address steric effects or to optimally orient the molecule. Although covalent binding protocols often involve a higher level of optimization than other approaches, coupling kits such as PolyLink are available to simplify the process. See TN 201, Working with Microspheres, and 205, Covalent Coupling.

Affinity Binding

Affinity binding is a straightforward method for immobilizing primary antibodies or biotinylated molecules. Proteins A and G and Fc-specific antibody coatings permit the directed immobilization of primary antibodies, and streptavidin is used extensively for the binding of biotinylated molecules such as antibodies, peptides and oligonucleotides. See TN 101, Affinity Ligand Microspheres, and 302, Molecular Biology.

It is important to note that each binding strategy has benefits and limitations, which should be weighed in the context of study objectives and the demands that will be placed on the finished reagent.

MICROSPHERE HANDLING

Washing

Washes are conducted as needed to normalize the buffer system, remove residuals that could interfere with ligand coating or activity, and transition microspheres through sequential steps of coating or use protocols.

Rare earth or electromagnetic separators are used to perform washes for superparamagnetic microspheres; see our Biomagnetic Separators (pages 52-54) for options including single- and multi-tube and 96-well plate magnetic separators.

For non-magnetic microspheres, the wash method(s) should be selected with both microsphere size and throughput in mind. Centrifugation is commonly used for microspheres 0.5µm+, while centrifugal filter devices*, dialysis or cross-flow filtration is typically employed for smaller (<0.5µm) diameters. (*Cat. AA022, Vivaspin® 2mL Ultrafiltration Device, page 55)

A single wash may consist of microsphere separation/settling (centrifugation), supernatant removal, reconstitution of microspheres in buffer, with ~2-3 repetitions performed for a given wash step. See TN203, Washing Microspheres.

Aggregation

Our microspheres are available in a variety of compositions, including polystyrene, poly(methyl methacrylate), and silica. Though polymer microspheres are more susceptible to hydrophobic-mediated aggregation, there are several factors that may influence dispersity of the suspension. For example, low surface charge, small diameter (high surface area : volume ratio), high microsphere concentration, and sub-optimal buffer composition or pH may promote aggregation. Strategies that are effective in addressing aggregation thus counter these conditions, i.e. use of surfactant to reduce hydrophobicity (e.g. 0.01 – 0.1% Tween® 20 or SDS), sonication and rotation to disrupt and disperse aggregates, and adjusting microsphere concentration or buffer pH to deter contact between individual spheres. See TN 202, Microsphere Aggregation, and PDS 699 (Cat. ROTAT) for details about our Tube Rotator.

Biomolecule	Typical Coating Strategies	Notes
Peptides	Covalent Streptavidin / Biotin	End-point attachment to preserve the activity of the peptide
Nucleic acids	Covalent Streptavidin / Biotin	End-point attachment to permit hybridization with target sequence
Proteins (e.g. antibodies)	Covalent Adsorption Streptavidin / Biotin (SA/B)	Common proteins, e.g. antibodies, are generally large enough that multi-point attachment and nonspecific orientation do not compromise activity. However, linkers or spacers (covalent or SA/B) may be employed to address steric effects or sub-optimal orientation.

POLYMER MICROSPHERES

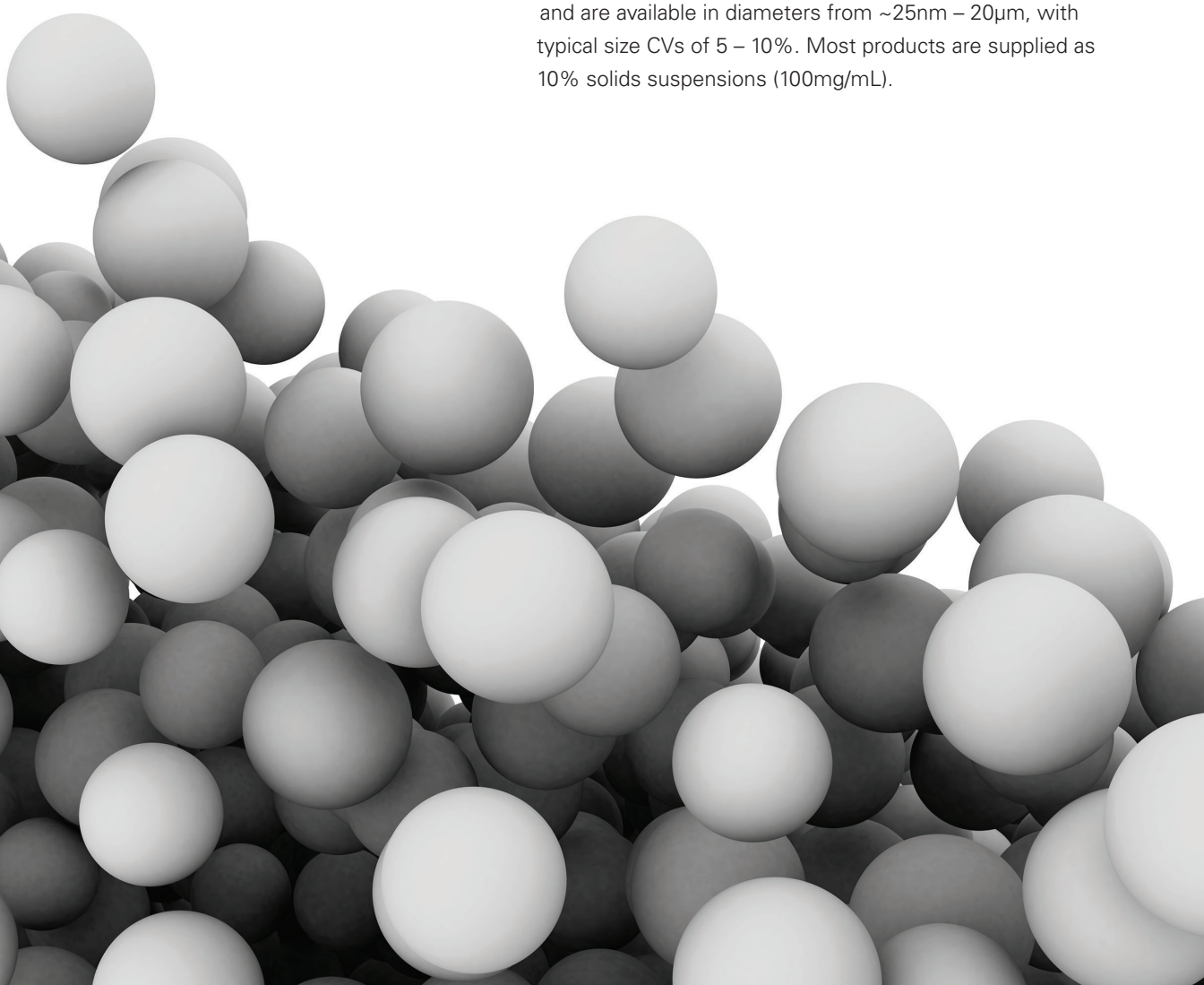
Polymer microspheres present a flexible platform for applications in diagnostics and bioseparations. They may be coated with ligands such as antibodies, antigens, peptides, or nucleic acids, and can be loaded with hydrophobic dyes and other compounds. Polymer microspheres also find extensive use as standards for instrument validation, set-up, and routine quality control.

Polystrene Properties	
Refractive Index (589nm)*	1.59
Density (g/cm^3)*	1.05
Softening Point, T_D (°C)*	95

*Reported value for bulk polymer.

NON-FUNCTIONALIZED POLYMER MICROSPHERES

We offer uniform polystyrene (PS) and crosslinked poly(styrene/divinylbenzene) (PS / DVB) microspheres that may be used as-is for standards or markers, or coated with proteins via adsorption for use in diagnostic tests and assays. (See TechNote 204, Adsorption to Microspheres.) Our spheres are synthesized via emulsion polymerization, and are available in diameters from ~25nm – 20µm, with typical size CVs of 5 – 10%. Most products are supplied as 10% solids suspensions (100mg/mL).

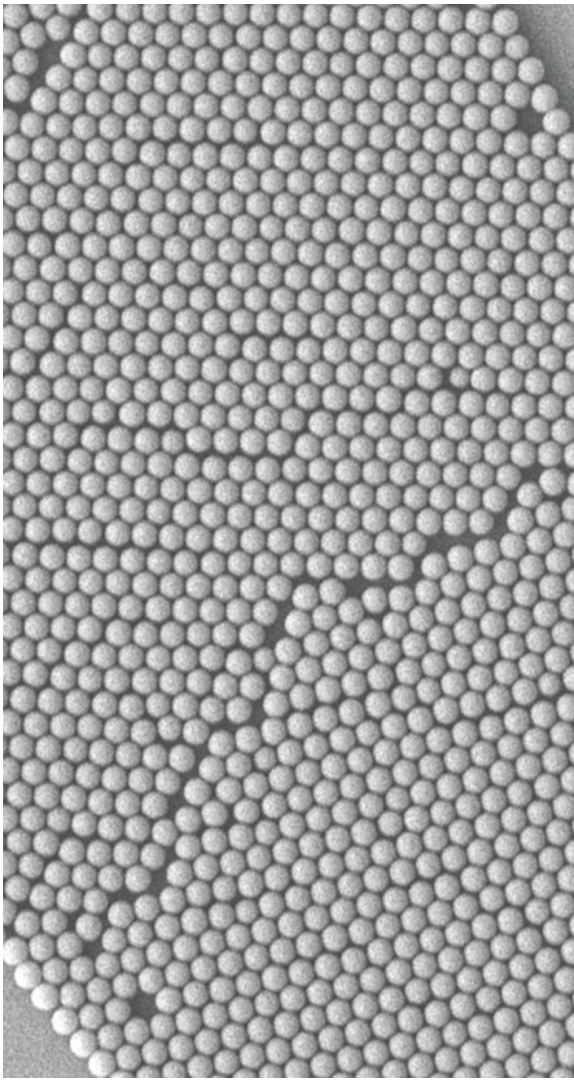


Plain Polystyrene

Antibodies and other proteins may be easily and stably adsorbed to hydrophobic, non-functionalized PS microspheres. Some products are crosslinked with divinylbenzene (DVB), which confers additional solvent and heat resistance. See TN204, Adsorption to Microspheres.

Catalog Number	Nominal Diameter	Specification Range
PS02001	0.025µm	0.015 - 0.035µm
PS02002	0.050µm	0.040 - 0.060µm
PS02003	0.075µm	0.065 - 0.085µm
PS02004	0.100µm	0.090 - 0.110µm
PS02005	0.125µm	0.115 - 0.135µm
PS02006	0.150µm	0.140 - 0.160µm
PS02007	0.175µm	0.165 - 1.185µm
PS02008	0.200µm	0.190 - 0.210µm
PS02009	0.300µm	0.270 - 0.330µm
PS02010	0.400µm	0.370 - 0.430µm
PS03001	0.500µm	0.470 - 0.530µm
PS03002	0.600µm	0.570 - 0.630µm
PS03003	0.700µm	0.670 - 0.730µm
PS03004	0.800µm	0.770 - 0.830µm
PS03005	0.900µm	0.870 - 0.930µm
PS04001	1.00µm	0.95 - 1.05µm
PS05001	2.00µm	1.80 - 2.20µm
PS05002	3.00µm	2.80 - 3.20µm
PS05003	4.00µm	3.80 - 4.20µm
PS06001	5.00µm	4.80 - 5.20µm
PS06002	5.50µm	5.30 - 5.70µm
PS06003	6.00µm	5.80 - 6.20µm
PS06004	7.00µm	6.80 - 7.20µm
PS06005	7.50µm	7.30 - 7.70µm
PS07001	10.00µm	9.50 - 10.50µm
PS07002	15.00µm	14.50 - 15.50µm
PS07003	20.00µm	19.00 - 21.00µm
PS08001	>25µm	>25µm

Plain polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

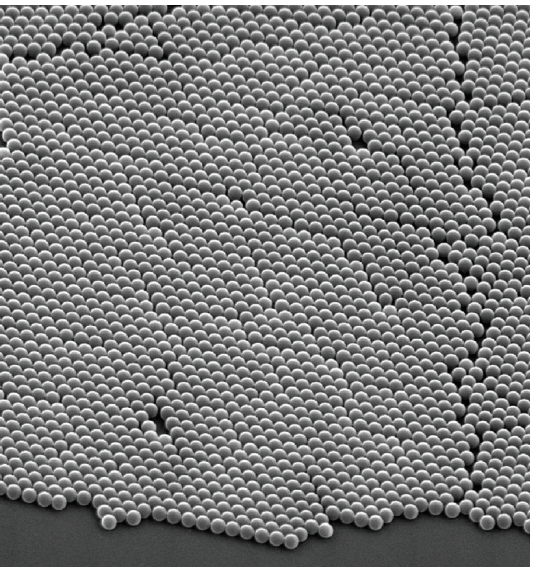


POLYMER MICROSPHERES

FUNCTIONALIZED POLYMER MICROSPHERES

Functionalized microspheres possess surface groups that may be used to generate covalently-bound coatings. These surface groups are also hydrophilic and potentially bear a charge, which may reduce hydrophobicity and contribute to ease of handling.

Our functionalized PS microspheres are suitable for the covalent immobilization of proteins, peptides, and nucleic acids. (See TN 205, Covalent Coupling.) They are synthesized via emulsion polymerization and are available in diameters up to ~20µm, with typical size CVs of 10%. Most products are supplied as 10% solids suspensions (100 mg/mL).



Amine Polymer

Amine-functionalized microspheres offer a trusted chemistry for the immobilization of biomolecules. Glutaraldehyde (Cat. # AA012) is often used to bind amine-containing compounds, and specialized linkers are available for targeted coupling of thiol or carbohydrate moieties to amine-functionalized microspheres. See TN 205, Covalent Coupling.

Catalog Number	Nominal Diameter	Specification Range
PA02001	0.200µm	0.190 - 0.210µm
PA03001	0.500µm	0.470 - 0.530µm
PA03002	0.750µm	0.740 - 0.760µm
PA04001	1.00µm	0.95 -1 .05µm

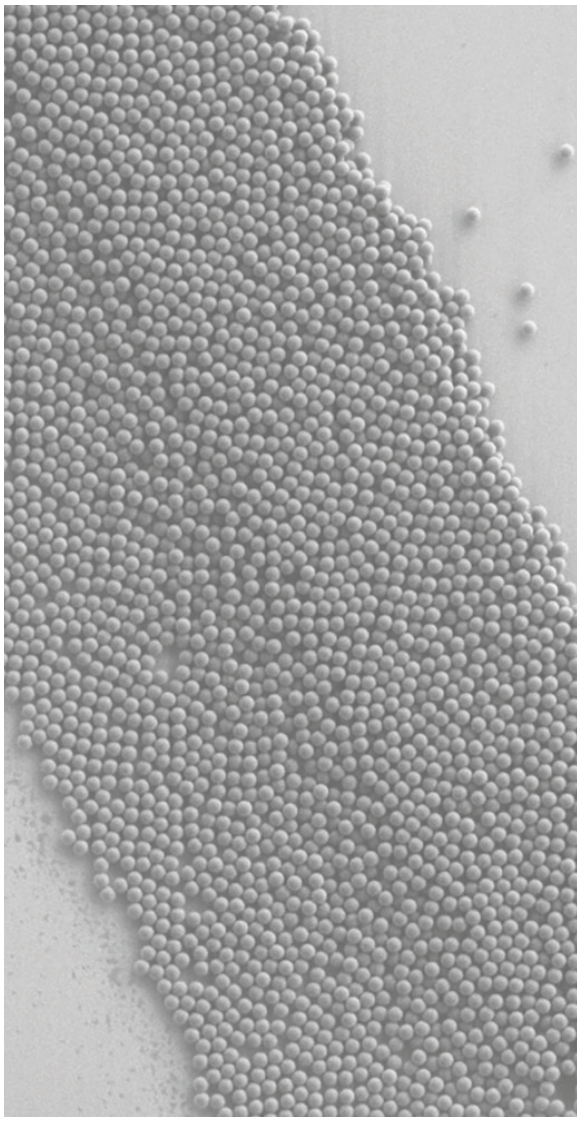
Amine polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Carboxyl Polymer

EDAC-mediated coupling is commonly used for the covalent immobilization of amine-terminated proteins, DNA, or other molecules to carboxyl-functionalized polymer [PS and P(S/DVB)] microspheres (EDAC Cat. # AA010). See TN 205, Covalent Coupling, for a protocol and tips on coating optimization and QC, or our PolyLink Protein Coupling Kit, page 46.

Catalog Number	Nominal Diameter	Specification Range
PC02001	0.025µm	0.015 - 0.035µm
PC02002	0.050µm	0.040 - 0.060µm
PC02003	0.070µm	0.061 - 0.080µm
PC02004	0.100µm	0.090 - 0.110µm
PC02005	0.125µm	0.115 - 0.135µm
PC02006	0.150µm	0.140 - 0.160µm
PC02007	0.175µm	0.165 - 0.185µm
PC02008	0.200µm	0.190 - 0.210µm
PC02009	0.300µm	0.270 - 0.330µm
PC02010	0.350µm	0.340 - 0.360µm
PC02011	0.400µm	0.370 - 0.430µm
PC03001	0.500µm	0.470 - 0.530µm
PC03002	0.600µm	0.570 - 0.630µm
PC03003	0.800µm	0.770 - 0.830µm
PC03004	0.900µm	0.870 - 0.930µm
PC04001	1.00µm	0.95 - 1.05µm
PC05001	2.00µm	1.80 - 2.20µm
PC05002	2.50µm	2.30 - 2.70µm
PC05003	3.00µm	2.80 - 3.20µm
PC05004	4.00µm	3.80 - 4.20µm
PC05005	4.50µm	4.30 - 4.70µm
PC06001	5.00µm	4.80 - 5.20µm
PC06002	5.50µm	5.30 - 5.70µm
PC06003	6.00µm	5.80 - 6.20µm
PC06004	7.00µm	6.80 - 7.20µm
PC07001	10.00µm	9.50 - 10.50µm
PC07002	15.00µm	14.50 - 15.50µm
PC07003	20.00µm	19.00 - 21.00µm
PC08001	>25µm	>25µm

Carboxyl polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



POLYMER MICROSPHERES

DYED MICROSPHERES

Visibly dyed microspheres are frequently used in lateral flow tests and "latex" agglutination tests. They are available in a range of intense colors that are suitable for visual or microscopic identification of positive test results.

Standard Visible Dye Colors

We offer polystyrene-based microspheres labeled with vibrant dyes for optimal visualization. Non-functionalized and carboxyl-functionalized surfaces are available to support adsorption and covalent immobilization strategies. Our visibly dyed microspheres are typically supplied as 5% solids suspensions (50mg/mL).

The adjacent color palette is provided to serve as a general reference only. Actual product hue may vary due to differences in microsphere composition and size, as well as the concentration of the suspension.

Dyed Polymer

Non-functionalized microspheres are suitable for coating with antibody or other large proteins via adsorption. See TN 204, Adsorption to Microspheres, for a general adsorption protocol.

Catalog Number	Dye	Nominal Diameter	Specification Range
DSCR001	Crimson Red	0.050µm	0.040 - 0.060µm
DSCB002	Cabo Blue	0.200µm	0.190 - 0.210µm
DSCR002	Crimson Red	0.200µm	0.190 - 0.210µm
DSSG002	Shamrock Green	0.200µm	0.190 - 0.210µm
DSBK002	Basic Black	0.200µm	0.190 - 0.210µm
DSCR003	Crimson Red	0.300µm	0.270 - 0.330µm
DSCR004	Crimson Red	0.400µm	0.370 - 0.430µm
DSCB005	Cabo Blue	0.800µm	0.770 - 0.830µm
DSCR005	Crimson Red	0.800µm	0.770 - 0.830µm
DSSG005	Shamrock Green	0.800µm	0.770 - 0.830µm
DSBK005	Basic Black	0.800µm	0.770 - 0.830µm
DSCR006	Crimson Red	5.00µm	4.80 - 5.20µm

Dyed polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Dyed Carboxyl Polymer

Biomolecules may be covalently immobilized to carboxyl-functionalized microspheres. A general coupling protocol is provided within TN205, Covalent Coupling; see also PolyLink Protein Coupling Kit, page 46.

Catalog Number	Dye	Nominal Diameter	Specification Range
DCCB001	Cabo Blue	0.200µm	0.190 - 0.210µm
DCCR001	Crimson Red	0.200µm	0.190 - 0.210µm
DCSG001	Shamrock Green	0.200µm	0.190 - 0.210µm
DCBK001	Basic Black	0.200µm	0.190 - 0.210µm
DCCB002	Cabo Blue	0.500µm	0.470 - 0.530µm
DCCR002	Crimson Red	0.500µm	0.470 - 0.530µm
DCCB004	Cabo Blue	1.00µm	0.95 - 1 .05µm
DCCR004	Crimson Red	1.00µm	0.95 - 1.05µm
DCTA004	Tangerine Orange	1.00µm	0.95 - 1.05µm
DCSG004	Shamrock Green	1.00µm	0.95 - 1.05µm
DCCB005	Cabo Blue	5.00µm	4.80 - 5.20µm
DCCR005	Crimson Red	5.00µm	4.80 - 5.20µm
DCBK005	Basic Black	5.00µm	4.80 - 5.20µm

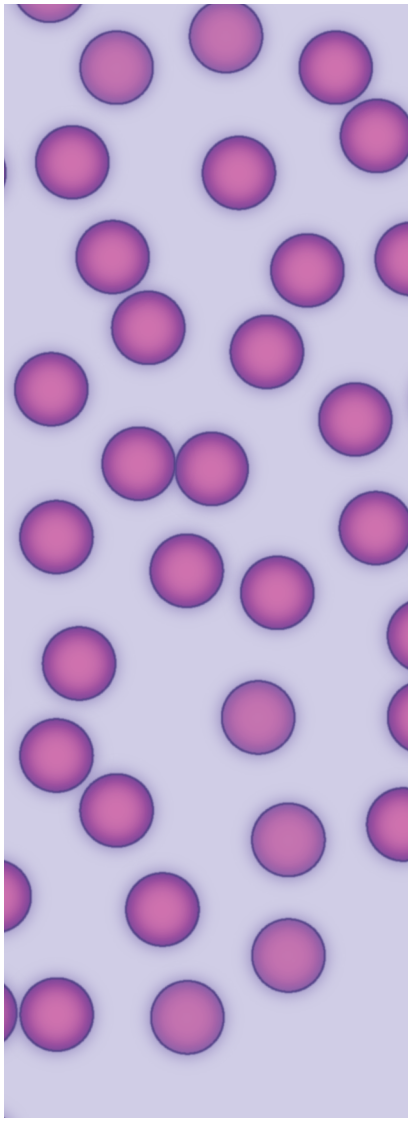
Dyed carboxyl polystyrene comes in units of 0.5, 1.0, 1.5, or 5.0 grams. (~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Dyed Streptavidin-Coated Polymer

Our inventory includes a number of streptavidin-coated submicron to micron-sized visibly dyed (see fluorescent, page 24) spheres. Visit our website or contact us for specific availability.

Catalog Number	Coating / Dye	Nominal Diameter	Specification Range
CDCR001	SA / Crimson Red	0.200µm	0.190 - 0.210µm
CDCB001	SA / Cabo Blue	0.200µm	0.190 - 0.210µm

Dyed protein coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



~5µm red dyed microspheres

POLYMER MICROSPHERES

FLUORESCENT MICROSPHERES

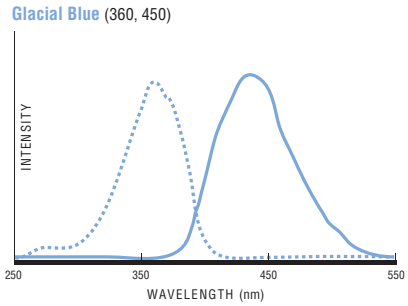
Many diagnostic and imaging applications rely on fluorescent microspheres for detection of binding events or signal enhancement. Addressable bead populations may be created with different intensities of fluorescence for the development of multiplexed suspension arrays, and small fluorescent spheres can function as the reporter for ELISA-type assays. Fluorescent microspheres are also useful for fluid tracing, cell tracking, or phagocytosis studies.

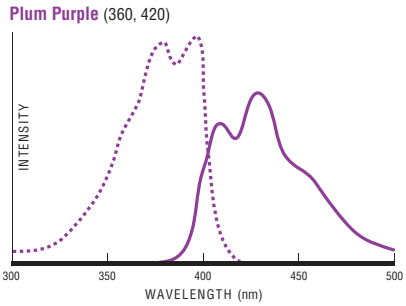
We offer polystyrene and crosslinked poly(styrene/divinylbenzene) microspheres as well as magnetic microspheres internally dyed with a variety of fluorescent dyes. Non-functionalized and carboxyl-functionalized surfaces are available to support adsorption and covalent immobilization strategies. Our fluorescent microspheres are supplied as 1% solids suspensions (10mg/mL).

Fluorescence Spectra

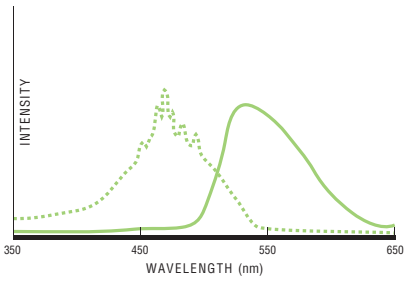
Bangs offers many diameters of microspheres dyed with our standard fluorophores including PS, PS-COOH, and magnetic versions. The excitation and emission maxima are noted with each set of spectra. For example, Glacial Blue (360, 450) excites maximally at 360nm and has its greatest emission at 450nm.

Spectra are provided to assist customers with the selection of appropriate fluorescent microspheres, and are not offered as a guarantee of performance.

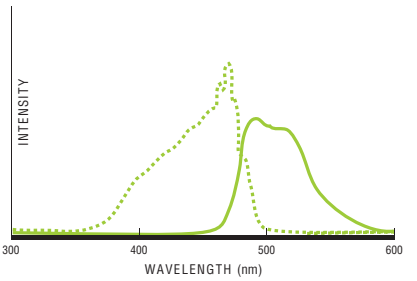




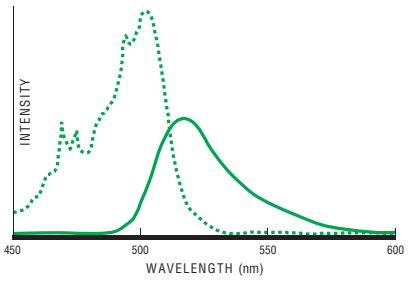
Surf Green (470, 525)



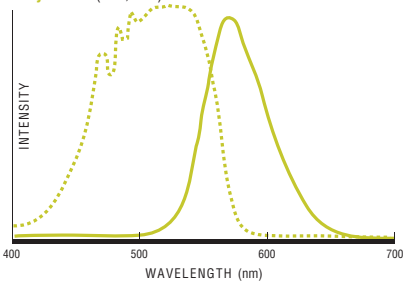
Yellow Green (YG) (441, 486)



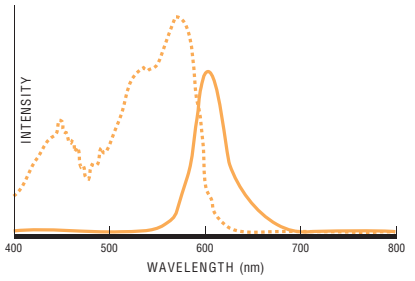
Dragon Green (480, 520)



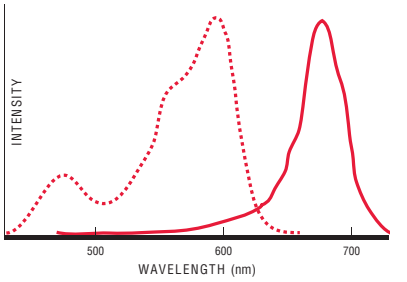
Envy Green (525, 565)



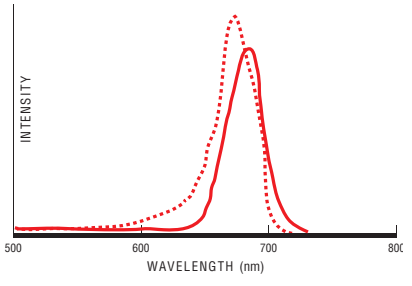
Suncoast Yellow (540, 600)



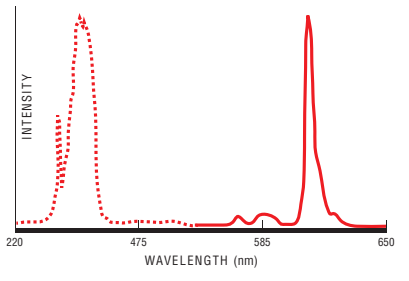
Far-Out Red (475, 590; 663)



Flash Red (660, 690)



Europium Chelate (365, 610)



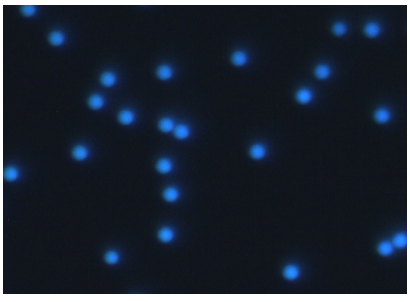
POLYMER MICROSPHERES

Fluorescent Polymer

Non-functionalized microspheres are suitable for coating via adsorption. See TN 204, Adsorption to Microspheres, for a general adsorption protocol.

Catalog Number	Fluorescence Color	Nominal Diameter	Specification Range
FSDG001	Dragon Green	0.050µm	0.040 - 0.060µm
FSFR001	Flash Red	0.050µm	0.040 - 0.060µm
FSDG002	Dragon Green	0.200µm	0.190 - 0.210µm
FSSY002	Suncoast Yellow	0.200µm	0.190 - 0.210µm
FSFR002	Flash Red	0.200µm	0.190 - 0.210µm
FSDG003	Dragon Green	0.500µm	0.470 - 0.530µm
FSPP003	Plum Purple	0.500µm	0.470 - 0.530µm
FSFR003	Flash Red	0.500µm	0.470 - 0.530µm
FSDG004	Dragon Green	1.00µm	0.95 - 1.05µm
FSEG004	Envy Green	1.00µm	0.95 - 1.05µm
FSPP004	Plum Purple	1.00µm	0.95 - 1.05µm
FSFR004	Flash Red	1.00µm	0.95 - 1.05µm
FSDG005	Dragon Green	2.00µm	1.80 - 2.20µm
FSPP005	Plum Purple	2.00µm	1.80 - 2.20µm
FSFR005	Flash Red	2.00µm	1.80 - 2.20µm
FSDG006	Dragon Green	4.00µm	3.80 - 4.20µm
FSEG006	Envy Green	4.00µm	3.80 - 4.20µm
FSFR006	Flash Red	4.00µm	3.80 - 4.20µm
FSDG007	Dragon Green	7.50µm	7.30 - 7.70µm
FSSY007	Suncoast Yellow	7.50µm	7.30 - 7.70µm
FSFR007	Flash Red	7.50µm	7.30 - 7.70µm
FSEG008	Envy Green	10.00µm	9.50 - 10.50µm
FSDG009	Dragon Green	15.00µm	14.50 - 15.50µm
FSDG011	Dragon Green	>25.00µm	>25.00µm

Fluorescent polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.

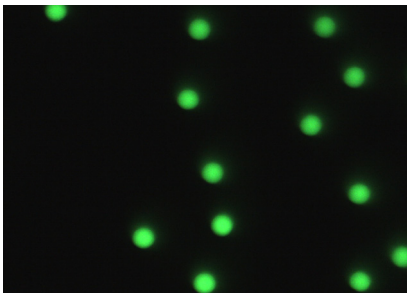


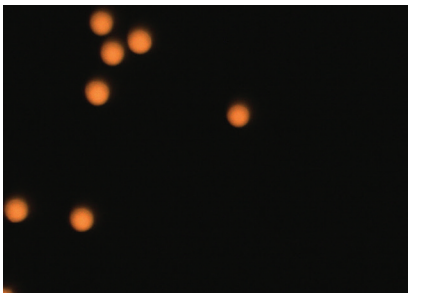
Fluorescent Carboxyl Polymer

Biomolecules may be covalently immobilized to carboxyl-functionalized microspheres. A general coupling protocol is provided in TN205, Covalent Coupling, or with our PolyLink Protein Coupling Kit, page 46.

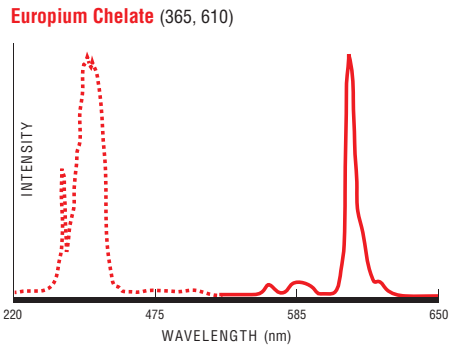
Catalog Number	Fluorescence Color	Nominal Diameter	Specification Range
FCDG001	Dragon Green	0.050µm	0.040 - 0.060µm
FCFR001	Flash Red	0.050µm	0.040 - 0.060µm
FCDG002	Dragon Green	0.100µm	0.090 - 0.110µm
FCDG003	Dragon Green	0.200µm	0.190 - 0.210µm
FCSG003	Surf Green	0.200µm	0.190 - 0.210µm
FCFR003	Flash Red	0.200µm	0.190 - 0.210µm
FCGB003	Glacial Blue	0.200µm	0.190 - 0.210µm
FCDG004	Dragon Green	0.400µm	0.370 - 0.430µm
FCFR004	Flash Red	0.400µm	0.370 - 0.430µm
FCDG005	Dragon Green	0.500µm	0.470 - 0.530µm
FCFR005	Flash Red	0.500µm	0.470 - 0.530µm
FCDG006	Dragon Green	1.00µm	0.95 - 1.05µm
FCEG006	Envy Green	1.00µm	0.95 - 1.05µm
FCSY006	Suncoast Yellow	1.00µm	0.95 - 1.05µm
FCGB006	Glacial Blue	1.00µm	0.95 - 1.05µm
FCFR006	Flash Red	1.00µm	0.95 - 1.05µm
FCSY007	Suncoast Yellow	2.00µm	1.80 - 2.20µm
FCDG008	Dragon Green	5.00µm	4.80 - 5.20µm
FCEG008	Envy Green	5.00µm	4.80 - 5.20µm
FCGB008	Glacial Blue	5.00µm	4.80 - 5.20µm
FCFR008	Flash Red	5.00µm	4.80 - 5.20µm
FCDG009	Dragon Green	10.00µm	9.50 - 10.50µm
FCDG011	Dragon Green	15.00µm	14.50 - 15.50µm

Fluorescent carboxyl polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.





POLYMER MICROSPHERES



Europium Chelate

Our Europium Chelate products offer extremely bright fluorescence and exceptional stability, in addition to well-functionalized carboxylated surfaces for the covalent attachment of ligand. Rare earth lanthanide chelates exhibit longer (microsecond) lifetimes, allowing fluorescence decay to be monitored in time-resolved fluorescence (TRF) based assays. Europium Chelate products are characterized by long Stokes shifts, or intervals between fluorescence excitation and emission maxima. This property lends itself to low background signal, and avoids regions of fluorescence overlap with other common reporters in multicolor assays.

Catalog Number	Description	Nominal Diameter	Specification Range
FCEU001	Europium Chelate - COOH	0.100µm	0.090 - 0.110µm
FCEU002	Europium Chelate - COOH	0.200µm	0.190 - 0.210µm
FCEU003	Europium Chelate - COOH	0.300µm	0.270 - 0.330µm
21960	Europium Chelate - COOH Sampler Pack	1mL of 0.100µm, 0.200µm, 0.300µm	

Fluorescent carboxyl polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Fluorescent Streptavidin-Coated Polymer

Our inventory typically includes streptavidin-coated fluorescent microspheres available in 0.2µm, 0.4µm, 0.5µm, and 1.0µm diameters. Visit our online Products section or contact us for specific availability.

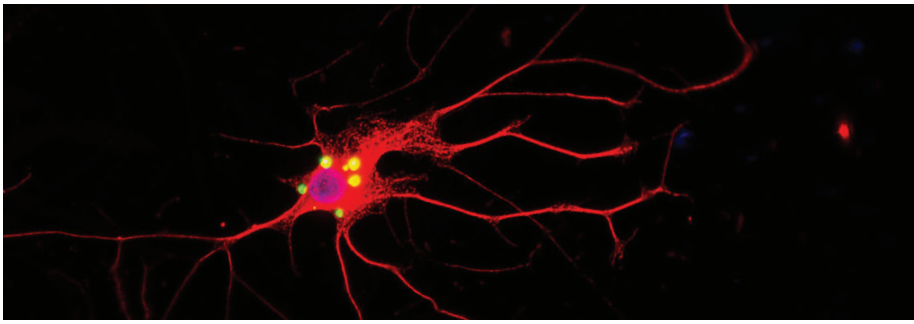
Catalog Number	Coating / Dye	Nominal Diameter	Specification Range
CFDG000	SA / Dragon Green	0.200µm	0.190 - 0.210µm
CFDG001	SA / Dragon Green	0.400µm	0.370 - 0.430µm
CFFR001	SA / Flash Red	0.400µm	0.370 - 0.430µm
CFDG002	SA / Dragon Green	0.500µm	0.470 - 0.530µm
CFDG003	SA / Dragon Green	1.00µm	0.95 - 1.05µm
CFFR003	SA / Flash Red	1.00µm	0.95 - 1.05µm

Fluorescent stretavidin polystyrene comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Fluorescent Magnetic

Our fluorescent magnetic microspheres have been used for cell tracking and assay development.

QuantumPlex™M offers a ready platform for suspension array development, page 27.



Catalog Number	Description	Fluorescence Color	Nominal Diameter	Specification Range
MCDG001	Classical Magnetic - COOH	Dragon Green	0.90µm	0.50 - 2.00µm
MCFR001	Classical Magnetic - COOH	Flash Red	0.90µm	0.50 - 2.00µm
MEDG001	Encapsulated Magnetic - COOH	Dragon Green	0.86µm	0.50 - 2.00µm
MEFR001	Encapsulated Magnetic - COOH	Flash Red	0.86µm	0.50 - 2.00µm
MEDG002	Encapsulated Magnetic - COOH	Dragon Green	1.63µm	0.50 - 2.00µm
MESY002	Encapsulated Magnetic - COOH	Suncoast Yellow	1.63µm	0.50 - 2.00µm
MEGB002	Encapsulated Magnetic - COOH	Glacial Blue	1.63µm	0.50 - 2.00µm
MEFR002	Encapsulated Magnetic - COOH	Flash Red	1.63µm	0.50 - 2.00µm
UMGB001	COMPEL - COOH	Glacial Blue	3µm	2.50 - 3.50µm
UMDG001	COMPEL - COOH	Dragon Green	3µm	2.50 - 3.50µm
UMEG001	COMPEL - COOH	Envy Green	3µm	2.50 - 3.50µm
UMFR001	COMPEL - COOH	Flash Red	3µm	2.50 - 3.50µm
UMGB002	COMPEL - COOH	Glacial Blue	6µm	5.50 - 6.50µm
UMDG002	COMPEL - COOH	Dragon Green	6µm	5.50 - 6.50µm
UMFR002	COMPEL - COOH	Flash Red	6µm	5.50 - 6.50µm
UMGB003	COMPEL - COOH	Glacial Blue	8µm	7.50 - 8.50µm
UMDG003	COMPEL - COOH	Dragon Green	8µm	7.50 - 8.50µm
UMFR003	COMPEL - COOH	Flash Red	8µm	7.50 - 8.50µm

Fluorescent magnetic polymer comes in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

POLYMER MICROSPHERES

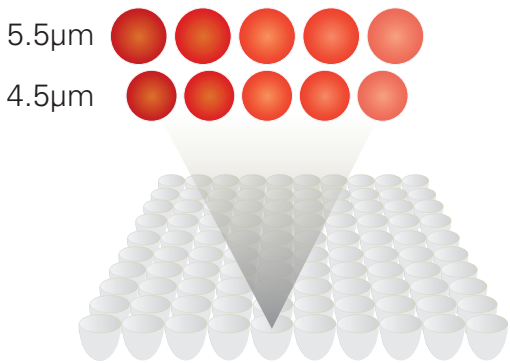
SUSPENSION ARRAYS

Suspension arrays for the flow cytometer feature populations of microspheres coated with different ligands for the interrogation of multiple targets within a given sample. Ligand-specific microsphere populations are encoded so that results for corresponding individual targets may be discerned. Encoding may be in the form of microsphere size and/or fluorescence signature, as with our QuantumPlex™ and QuantumPlex™M platforms.

QUANTUMPLEX™

Our QuantumPlex kits provide a general platform for multiplexed assay development on standard flow cytometers. Microsphere populations in 5 - bead kits are encoded with different intensities of Starfire Red™ and the two size kits (4.4 µm, 5.5 µm) may be combined to extend the array. Starfire Red™ excites at 488nm or 635nm, and emits in the red channel (e.g., PE-Cy™5, APC) with very little carryover into lower wavelengths, which leaves other detectors available for determination of positive binding events via common reporters such as FITC and PE.

QuantumPlex kits are available with two different surfaces to accommodate the coating strategy of choice: carboxyl (COOH) and streptavidin (SA).



Catalog Number	Description
235	QuantumPlex COOH 4.4µm, 5 populations
238	QuantumPlex COOH 5.5µm, 5 populations
239	QuantumPlex COOH 4.4µm and 5.5µm, 10 populations
215	QuantumPlex SA 4.4µm, 5 populations
218	QuantumPlex SA 5.5µm, 5 populations
219	QuantumPlex SA 4.4µm and 5.5µm, 10 populations

QuantumPlex comes in 1mL(pop 5 x 100 data points), 5mL(pop 5 x 500 data points), and 10mL(pop 5 x 1000 data points).

QuantumPlex™ SP

QuantumPlex SP (Single Population) is useful for the development of simplex flow cytometric assays or for the optimization of attachment chemistry and assay parameters before transitioning to a multiplexed format. Like QuantumPlex, they are dyed with Starfire Red™ and are suitable for use on standard flow cytometers.

Catalog Number	Description
234	QuantumPlex SP COOH 4.4µm
237	QuantumPlex SP COOH 5.5µm
214	QuantumPlex SP SA 4.4µm
217	QuantumPlex SP SA 5.5µm

QuantumPlex SP comes in 1mL (100 data points) and 3mL (300 data points)

QuantumPlex™M

QuantumPlex M (Magnetic) kits consist of five populations of ~6µm highly uniform superparamagnetic microspheres encoded with different intensities of Starfire Red™. Like QuantumPlex, they are suitable for use on standard flow cytometers. Highly efficient separations may be performed using rare earth magnetic separators.

Catalog Number	Description
250	QuantumPlex M COOH 5 populations
252	QuantumPlex M SA 5 populations

QuantumPlex M comes in 1mL (pop 5 x 100 data points), 5mL (pop 5 x 500 data points), and 10mL (pop 5 x 1000 data points).

QuantumPlex™M SP

QuantumPlex M SP is useful for the development of simplex flow cytometric assays, or for the optimization of attachment chemistry and assay parameters before transitioning to a multiplexed format. Like QuantumPlex M, they are ~6µm highly uniform superparamagnetic microspheres dyed with Starfire Red™ and are suitable for use on standard flow cytometers.

Catalog Number	Description
251	QuantumPlex M SP COOH
253	QuantumPlex M SP SA

QuantumPlex M SP comes in 1mL (100 data points) and 3mL (300 data points)

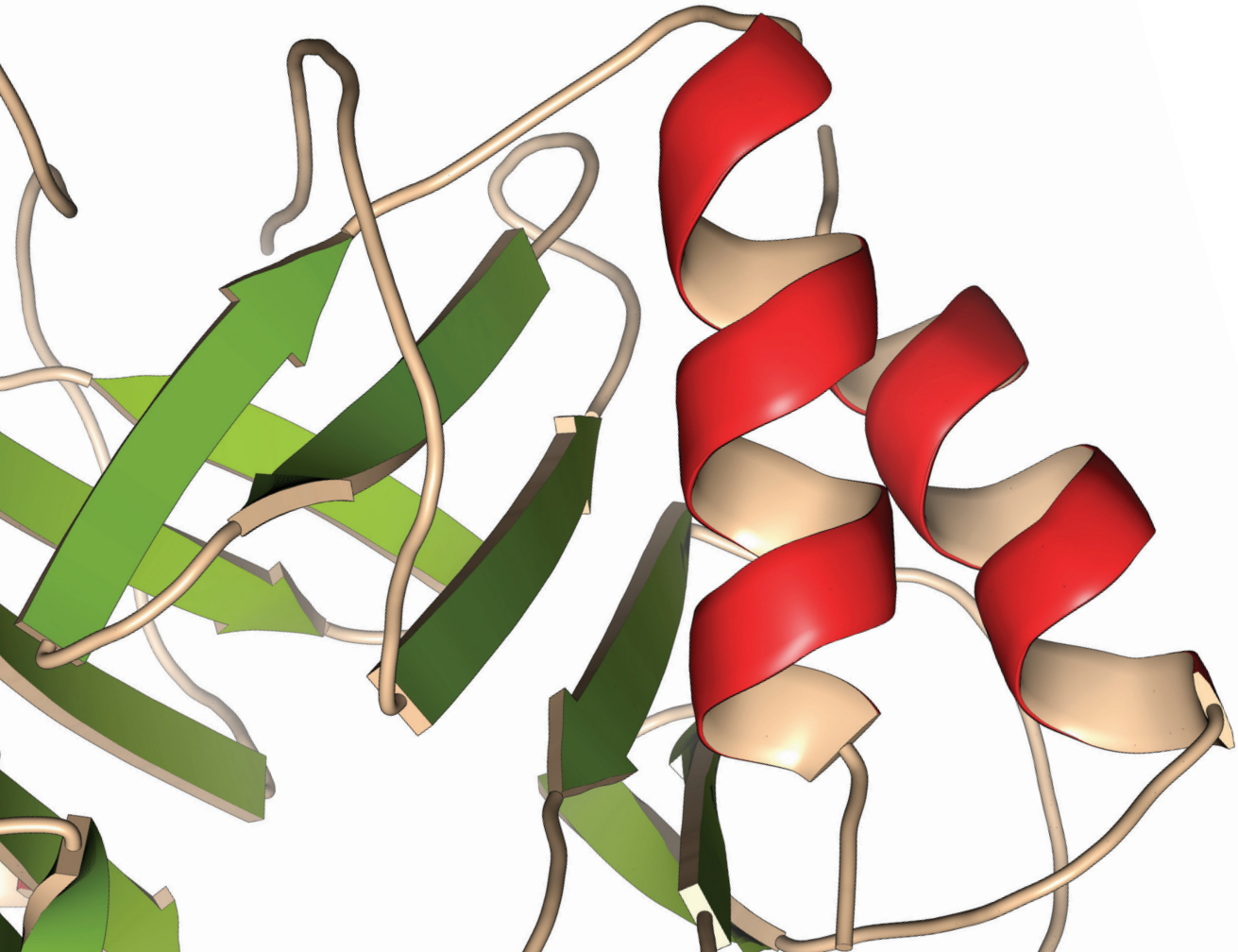
POLYMER MICROSPHERES

AFFINITY LIGAND COATED MICROSPHERES

When circumstances call for the rapid development of microsphere reagents, particles coated with affinity ligands offer a ready solution. Affinity binding protocols are straightforward, typically involving a simple incubation of the coated spheres with the appropriate binding protein. Binding proteins also provide an opportunity to optimally orient the ligand, as with the end-point immobilization of biotinylated oligonucleotides to streptavidin-coated microspheres, or the Fc-specific immobilization of antibodies via Protein A or G.

Particles coated with binding proteins also find significant use in purifications. Streptavidin-coated microspheres are often used in the isolation of biotinylated PCR amplicons. Protein A and Protein G microspheres are utilized for purification of antibodies and Fc-tagged fusion proteins, as well as for the recovery of Ab/Ag complexes in immunoprecipitation.

The activity of each Lot of coated microspheres is determined through binding of an appropriate fluorophore-conjugated ligand and spectrofluorimetric assay. The resulting binding capacity is reported on the Certificate of Analysis that accompanies product shipment.



Streptavidin

Our streptavidin- and SuperAvidin™- coated polystyrene microspheres offer simple and extremely stable binding of biotinylated molecules such as antibodies, peptides, and oligonucleotides for use in diagnostics, screening, and affinity purifications. See TN 101, Affinity Ligand Microspheres, and PDS 721.

Catalog Number	Nominal Diameter	Specification Range
CP01000	0.100µm	0.090 - 0.110µm
CP01001	0.200µm	0.190 - 0.210µm
CP01003	0.500µm	0.470 - 0.530µm
CP01004	1.00µm	0.95 - 1.05µm
CP01005	3.00µm	2.80 - 3.20µm
CP01006	5.00µm	4.80 - 5.20µm
CP01007	10.00µm	9.50 - 10.50µm
CP01008	15.00µm	14.50 - 15.50µm

Streptavidin coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Catalog Number	Description	Nominal Diameter	Specification Range
CMC0100	SA Classical Magnetic	0.2 - 0.5µm	0.2 - 0.5µm
CME0101	SA Encapsulated Magnetic	0.7 - 1.2µm	0.7 - 1.2µm
UMC0100	SA COMPEL Magnetic	3µm	2.50 - 3.50µm
UMC0101	SA COMPEL Magnetic	6µm	5.50 - 6.50µm
UMC0102	SA COMPEL Magnetic	8µm	7.50 - 8.50µm

Streptavidin coated magnetic polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Biotin

The avidin / biotin interaction is one of the strongest non-covalent bonds (K_a=10^{15}/M vs. 10^7-10^{11}/M for antibody-antigen interactions). This secure bond, combined with the small size of biotin (MW=244.3), yields an ideal system for affinity binding, with numerous applications in areas such as immunology and cell / molecular biology. See TN101 and PDS 724.

Catalog Number	Nominal Diameter	Specification Range
CP10000	10.00µm	9.50 - 10.50µm

Biotin coated polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

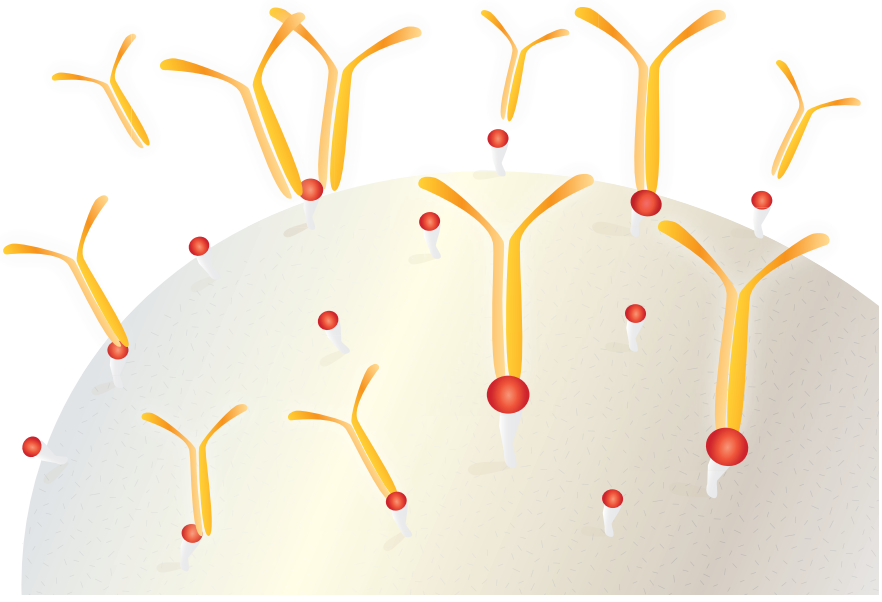
POLYMER MICROSPHERES

Proteins A and G

Protein A and Protein G readily bind the Fc regions of many IgG isotypes. For this reason, they are used extensively for affinity purification of antibodies from serum or cell culture supernatant, and for capture of immunoprecipitated protein complexes. When Protein A and Protein G microspheres are used as reagents in tests and assays, the immobilized antibodies may be crosslinked to the coated support for long-term stability. You can find our magnetic Protein A and G products on pages 38, 43, and our flow cytometry Protein A & G beads on page 80. See also TN101 and PDS 722 for more information.

Catalog Number	Description	Nominal Diameter	Specification Range
CP02000	Protein A Polymer	1.00µm	0.95 - 1.05µm
CP02001	Protein A Polymer	5.00µm	4.80 - 5.20µm
CP02002	Protein A Polymer	10.00µm	9.50 - 10.50µm

Protein A polystyrene comes in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



Host Species	Antibody Class	Protein A Affinity Strength	Protein G Affinity Strength
Mouse	Total IgG	Strong	Strong
	IgG_1	Weak	Medium
	IgG_{2a}	Strong	Strong
	IgG_{2b}	Strong	Strong
Rat	Total IgG	Weak	Medium
	IgG_1	Weak	Medium
	IgG_{2a}	No Binding	Strong
	IgG_{2b}	No Binding	Weak
	IgG_{2c}	Strong	Strong
Human	Total IgG	Strong	Strong
	IgG_1	Strong	Strong
	IgG_2	Strong	Strong
	IgG_3	Weak	Strong
	IgG_4	Strong	Strong
Goat	Total IgG	Weak	Strong
	IgG_1	Weak	Strong
	IgG_2	Strong	Strong
Rabbit	Total IgG	Strong	Strong
Hamster	Total IgG	Weak	Medium
Sheep	Total IgG	Weak	Strong
	IgG_1	Weak	Strong
	IgG_2	Strong	Strong
Guinea Pig	Total IgG	Strong	Weak
Donkey	Total IgG	Medium	Strong

Additional Products

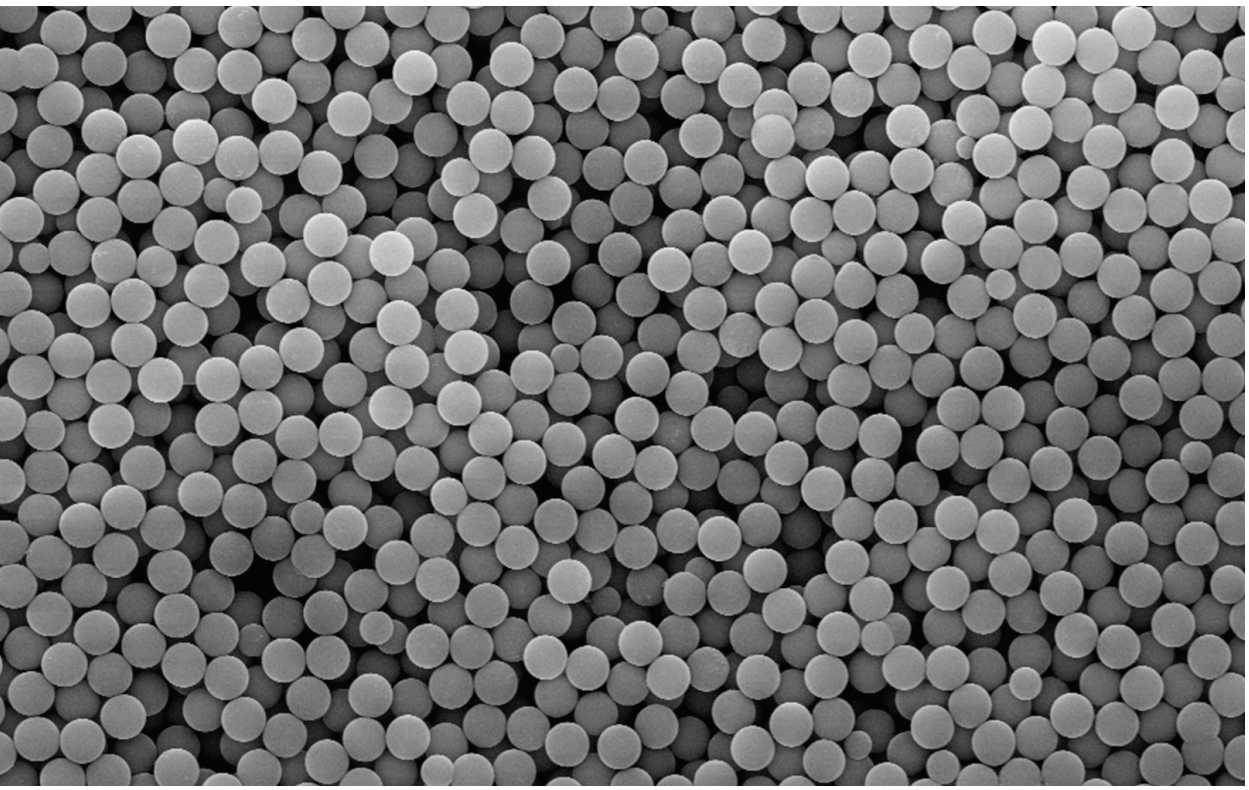
Our line of BioMag® superparamagnetic particles includes many affinity coatings, such as streptavidin, biotin, Protein A, Protein G, oligo dT, wheat germ agglutinin (WGA), Concanavalin A (Con A), and a range of secondary antibodies (pages 42 - 45).

SILICA MICROSPHERES

Inorganic supports such as silica microspheres have become increasingly important for a variety of applications, including isolation of nucleic acids, cell separation, and immuno- and DNA-based assays. The unique properties of a silica substrate offer benefits such as flexible silanization chemistries, unique refractive index and density, low autofluorescence, low nonspecific binding of proteins, hydrophilicity & ease of handling.

Silica Properties	
Surface Functionalities	SiOH (plain), COOH, NH_2, SA, Bind-IT
Refractive Index (589nm)	~1.43 – 1.46
Density (g/cm^3)	~2.0
Glass Transition Temperature (°C)*	>>1000

** Reported value for bulk silica.*



Plain Silica

SiO_2 with natural hydroxyl or silanol (SiOH) surface groups that are available for silanization. See TN104 and PDS 702.

Catalog Number	Nominal Diameter	Specification Range
SS02000	0.150µm	0.120 - 0.180µm
SS02001	0.300µm	0.260 - 0.340µm
SS02002	0.400µm	0.360 - 0.440µm
SS03000	0.500µm	0.460 - 0.540µm
SS03001	0.700µm	0.660 - 0.740µm
SS03002	0.900µm	0.860 - 0.940µm
SS04000	1.00µm	0.95 - 1.05µm
SS04001	1.50µm	1.40 - 1.60µm
SS04002	2.00µm	1.80 - 2.20µm
SS05000	2.50µm	2.30 - 2.70µm
SS05001	3.00µm	2.80 - 3.20µm
SS05002	4.00µm	3.80 - 4.20µm
SS05003	5.00µm	4.80 - 5.20µm
SS06000	>5.00µm	>5.00µm

Plain silica comes in weights of 0.5, 1.0, 1.5, or 5.0 grams. (~10% solids 100 mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Plain Silica in Dry Form

SiO_2 with natural hydroxyl or silanol (SiOH) surface groups that are available for silanization. See TN104 and PDS 702.

Catalog Number	Nominal Diameter	Specification Range
SSD2001	0.300µm	0.260 - 0.340µm
SSD3000	0.500µm	0.460 - 0.540µm
SSD4000	1.00µm	0.95 - 1.05µm
SSD4001	1.50µm	1.40 - 1.60µm
SSD5000	2.50µm	2.30 - 2.70µm
SSD5001	3.00µm	2.80 - 3.20µm
SSD5002	4.00µm	3.80 - 4.20µm
SSD5003	5.00µm	4.80 - 5.20µm

Plain dry silica comes in weights of 0.5, 1.0, 1.5, or 5.0 grams. Please see BangsLabs.com for pricing or contact a local agent.

SILICA MICROSPHERES

Carboxyl Silica

SiO_2 with carboxyl (COOH) surface groups for the covalent attachment of biomolecules, supplied dry. See PDS 702.

Catalog Number	Nominal Diameter	Specification Range
SC03000	0.500µm	0.460 - 0.540µm
SC04000	1.00µm	0.95 - 1.05µm
SC05000	2.00µm	2.80 - 2.20µm
SC05001	5.00µm	4.80 - 5.20µm

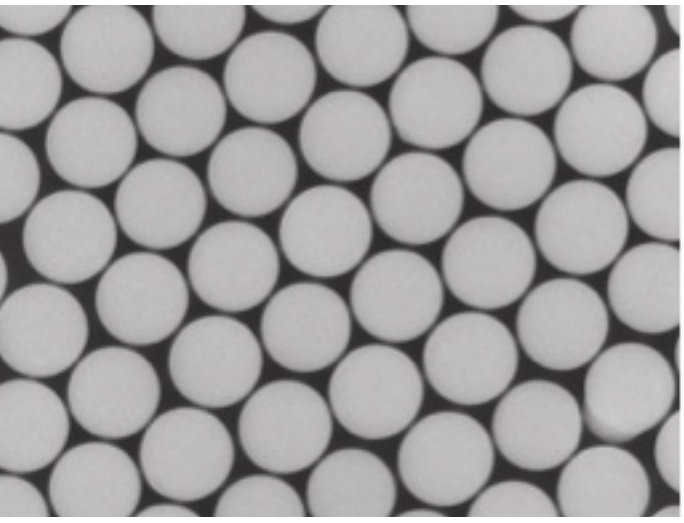
Carboxyl silica unit size is 1.0 gram. Please see BangsLabs.com for pricing or contact a local agent.

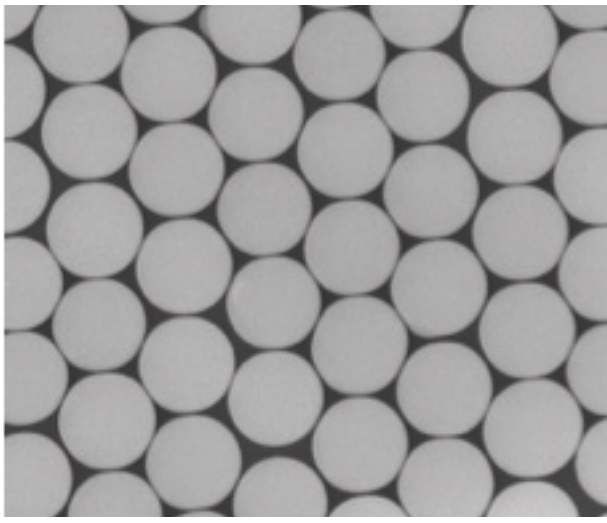
Amine Silica

SiO_2 with amine (NH_2) surface groups for the covalent attachment of biomolecules, supplied dry. See PDS 702.

Catalog Number	Nominal Diameter	Specification Range
SA03000	0.500µm	0.460 - 0.540µm
SA04000	1.00µm	0.95 - 1.05µm
SA05000	5.00µm	4.80 - 5.20µm

Amine silica unit size is 1.0 gram. Please see BangsLabs.com for pricing or contact a local agent.





Streptavidin Coated Silica

SiO_2 with a streptavidin coating for the attachment of biotinylated molecules, supplied at 1% solids (10mg/mL). See TN101 and PDS 702.

Catalog Number	Nominal Diameter	Specification Range
CS01000	0.500µm	0.460 - 0.540µm
CS01001	1.00µm	0.95 - 1.05µm
CS01002	5.00µm	4.80 - 5.20µm

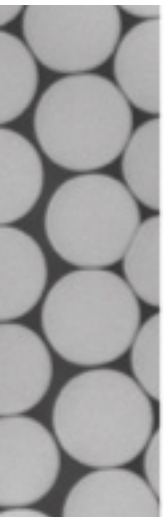
Streptavidin coated silica comes in volumes of 1mL, 2mL, 5mL, or 10mL. (~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

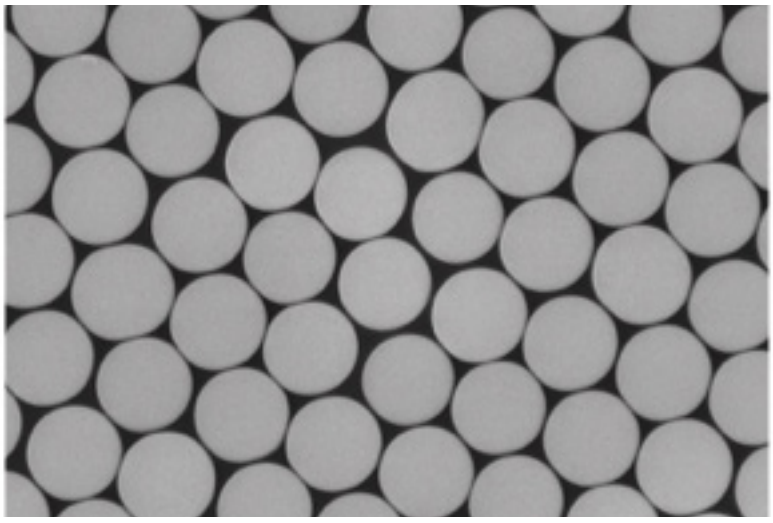
Silica Bind-IT™

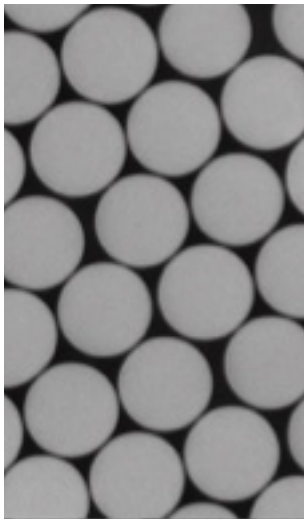
Silica Bind-IT™ are pure SiO_2 with a pre-activated surface that allows ready binding of antibody without sacrificing stability. Provided at 2.5% solids (25mg/mL) in two nominal diameters, 1µm and 5µm. See PDS 737.

Catalog Number	Nominal Diameter	Specification Range
SB04000	1.00µm	0.95 - 1.05µm
SB06000	5.00µm	4.80 - 5.20µm

Silica Bind-IT comes in volumes of 2mL, 5mL, or 10mL. (~2.5% solids 25mg/mL) Please see BangsLabs.com for pricing or contact a local agent.







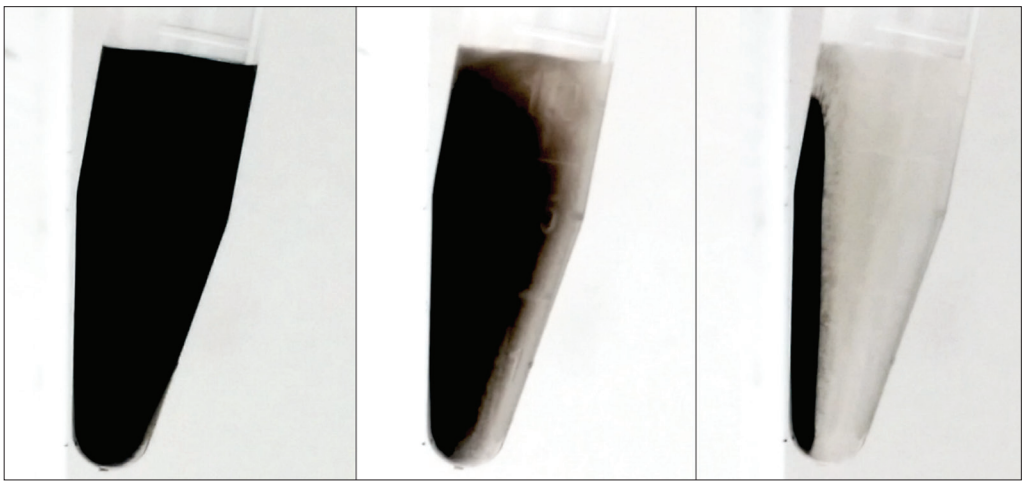
MAGNETIC MICROSPHERES & PARTICLES

Superparamagnetic particles have been utilized extensively in diagnostic and other research applications for the capture of biomolecules and cells. They confer a number of benefits, including ease of separation and suitability for automation. Magnetic particle-based diagnostic assays demand the highest performance in terms of physical handling, ligand binding characteristics, and signal-to-noise ratios. Bead composition directly impacts settling and magnetic separation profiles, which have implications for assay parameters such as incubation times for binding and elution steps, buffer changes, etc. Most importantly, the composition impacts specific / nonspecific binding characteristics, and background signal arising from the particle itself. These factors have a direct impact on the sensitivity and dynamic range of the assay.

Our comprehensive magnetic particle offerings allow us to address the unique requirements of specific assay systems, with options for particle diameter, morphology, surface properties, separation profile, and other characteristics. No other company offers such a complete collection for your screening and development efforts. We synthesize at scales that will carry you from R&D through manufacturing, and under an ISO 13485 Quality System that will meet your regulatory needs. We invite you to explore the vast technical resources on our website, or to contact us directly to discuss your next development project.

Assay	
Chemiluminescence	ProMag® HP
Immuno	ProMag®, ProMag®HP, COMPEL™, or BioMag®
Molecular	Magnefy™ , ProMag®, ProMag® HP or COMPEL™
Flow cytometric	COMPEL™

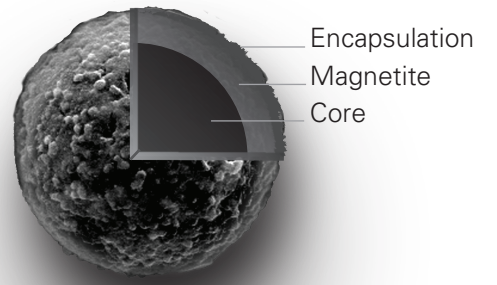
See Magnetic Separators, page 52 - 54 or our Magnetic Beads for Assay Development Brochure from BangsLabs.com.



Magnetic Separation

Magnefy™

Meet the newest addition to our family of magnetic particles–Magnefy™ ~1µm carboxylated superparamagnetic microspheres. As high surface area / high surface titer microparticles with a rapid separation profile, Magnefy offer an additional performance-driven solid phase for magnetic particle-based assays and isolations. See PDS 756.

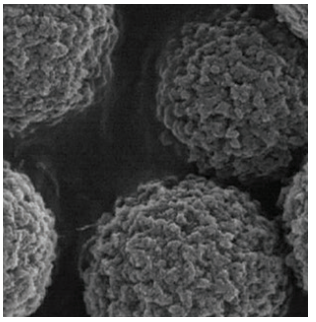


Catalog Number	Description	Nominal Diameter	Unit size
MFY0002	Magnefy™ COOH	1µm	5mL, 10mL, 25mL, 100mL

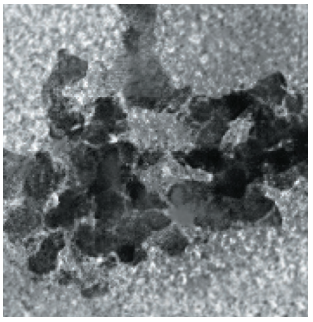
(~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

Magnetic Particle Sampler Packs

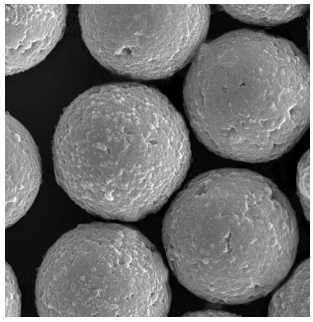
For development efforts, our Magnetic Particle Sampler Packs allow you to test different particles to find which yield optimal performance characteristics in your specific system. Choose from carboxylated or streptavidin coated versions. See PDS 749.



ProMag



BioMag

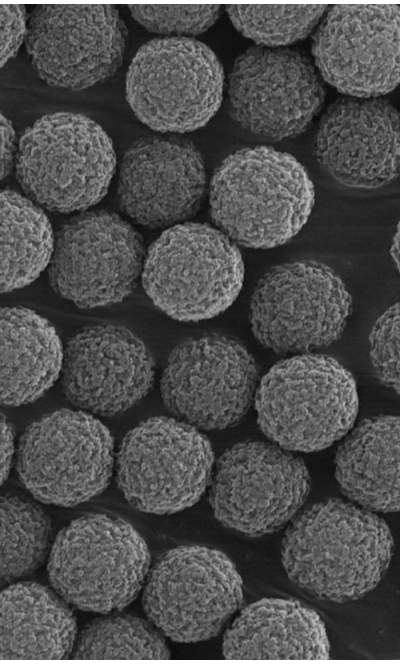


ProMag HP

COOH Magnetic Sample Pack Includes:	
Catalog Number	**Description**
21940	MFY0002 - Magnefy™ • COOH - 5mL (5% solids)
	PMC1N - ProMag® 1 Series • COOH - 5mL (2.5% solids)
	PMC3HP - ProMag® 3 HP • COOH - 5mL (2.5% solids)
	BP618 - BioMag®Plus • COOH - 5mL (20mg / mL)
Streptavidin Magnetic Sample Pack Includes:	
Catalog Number	**Description**
21950	PMS1N - ProMag® 1 Series • Streptavidin - 1mL (1% solids)
	PMS3HP - ProMag® 3 HP • Streptavidin - 1mL (1% solids)
	BP628 - BioMag®Plus • Streptavidin - 2mL (5mg / mL)

Please see BangsLabs.com for pricing or contact a local agent.

MAGNETIC MICROSPHERES & PARTICLES

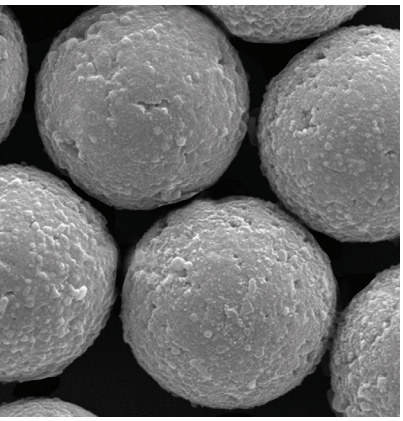


ProMag®

ProMag are highly uniform 1µm and 3µm polymer-based magnetic spheres. A unique surface means low nonspecific binding in protein-based systems, and superior handling without the use of surfactant. These high-binding particles are suitable for use across a range of research and diagnostic applications. ProMag offer rapid and uniform separations that are particularly important to automated assays. See PDS 715 and 735.

Catalog Number	Description	Nominal Diameter	Unit size
PMC1N	ProMag 1 Series • COOH	1µm	5mL or 25mL
PMC3N	ProMag 3 Series • COOH	3µm	5mL or 25mL
PMA3N	ProMag 3 Series • NH_2	3µm	5mL or 25mL
PMS1N	ProMag 1 Series • Streptavidin	1µm	1mL, 2mL, 5mL, or 10mL
PMS3N	ProMag 3 Series • Streptavidin	3µm	1mL, 2mL, 5mL, or 10mL
PMB3N	ProMag 3 Series • Bind-IT™	3µm	2mL, 5mL, or 10mL
PMG3N	ProMag 3 Series • Protein G	3µm	1mL, 2mL, 5mL, or 10mL

(COOH, NH_2 & Bind-IT, ~2.5% solids 25mg/mL) (SA & Protien G ~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.



ProMag® HP

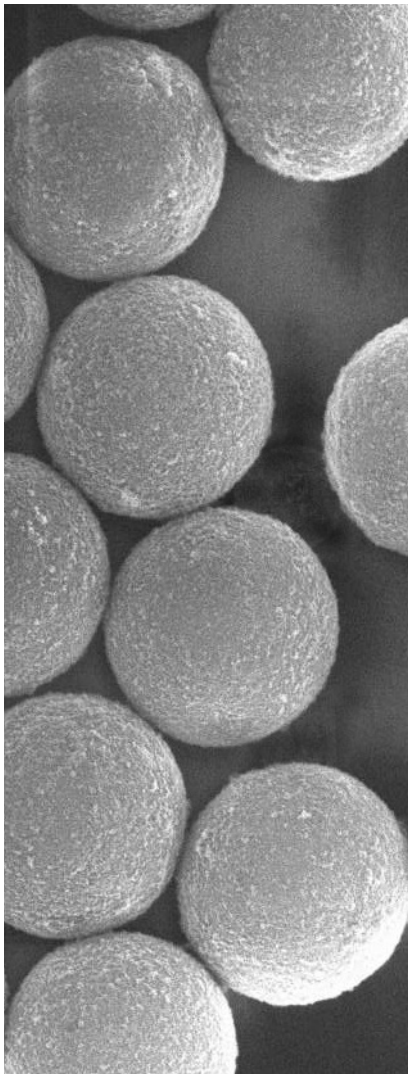
ProMag HP (High Performance) have been meticulously engineered for use in assay development. The highly optimized composition ensures lowest autosignal, particularly with respect to chemiluminescence and exposed iron. See PDS 743.

Catalog Number	Description	Nominal Diameter	Unit size
PMC3HP	ProMag HP 3 Series • COOH	3µm	5mL or 25mL
PMS3HP	ProMag HP 3 Series • Streptavidin	3µm	1mL, 2mL, 5mL, or 10mL

(COOH ~2.5% solids 25mg/mL) (SA ~1% solids 10mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

COMPEL™

COMPEL are highly uniform superparamagnetic microspheres ideal for applications that demand uniform particle response, such as miniaturized bioassays and separations. COMPEL are comprised of iron oxide crystals dispersed in a polymer matrix, with a functional polymer overcoating for encapsulation of magnetite and introduction of reactive groups. As they are polymer-based, they retain the low density that is advantageous for biomolecular assays. See QuantumPlex M, page 27, for our suspensions array platform based on COMPEL.



Parameter	Description
Composition	Magnetite in a polymer matrix
Morphology	Spherical
Surface Functionalities	COOH, SA
Density (g/cm^3)*	~1.1 – 1.2
Iron Oxide Content (%)*	~2.4 – 12.0

* Diameter dependent

COMPEL™ Carboxyl

COMPEL Carboxyl may be coated using traditional EDAC-based chemistry, such as that featured in our PolyLink Protein Coupling Kit (page 46). See also PDS 705.

Catalog Number	Nominal Diameter	Specification Range
UMC3001	3µm	2.50 - 3.50µm
UMC3002	6µm	5.50 - 6.50µm
UMC4001	8µm	7.50 - 8.50µm

Carboxyl COMPEL comes in units of 0.5g, 1g, 1.5g or 5g (~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

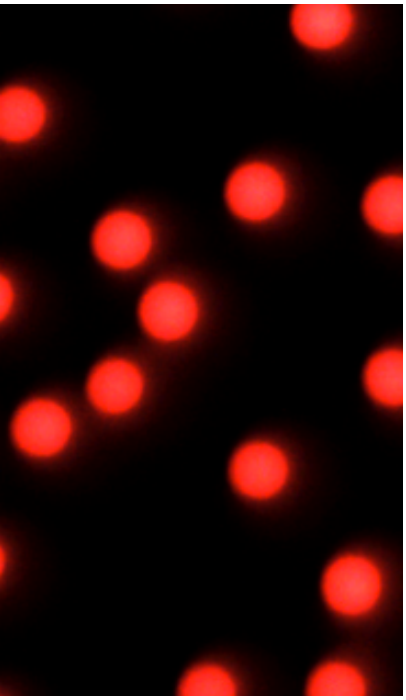
MAGNETIC MICROSPHERES & PARTICLES

COMPEL™ Streptavidin

Streptavidin-coated COMPEL offer the combined ease of affinity binding and magnetic separation. See PDS 721.

Catalog Number	Nominal Diameter	Specification Range
UMC0100	3µm	2.50 - 3.50µm
UMC0101	6µm	5.50 - 6.50µm
UMC0102	8µm	7.50 - 8.50µm

Streptavidin coated COMPEL come in units of 1mL, 2mL, 5mL or 10mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.



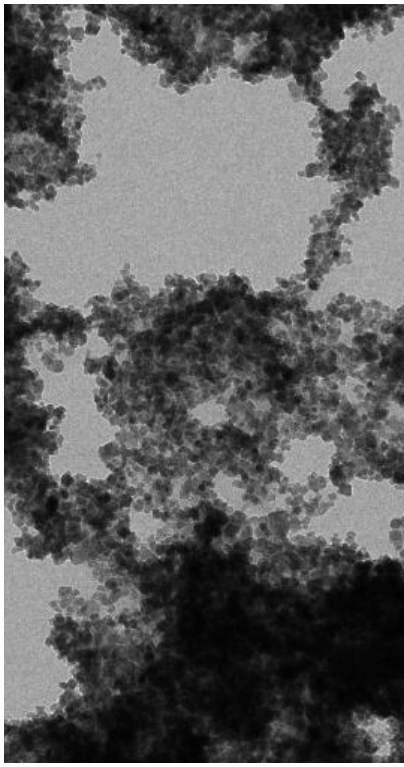
COMPEL™ Fluorescent

As COMPEL spheres are polymer-based, we are able to use them to make bright internally-dyed microsphere standards. Fluorophores include Glacial Blue (360, 450), Dragon Green (480, 520), Envy Green (525,565), and Flash Red (660, 690). See pages 20-21 for spectra. See PDS 705.

Catalog Number	Fluorescence Color	Nominal Diameter	Specification Range
UMGB001	Glacial Blue	3µm	2.50 - 3.50µm
UMDG001	Dragon Green	3µm	2.50 - 3.50µm
UMEG001	Envy Green	3µm	2.50 - 3.50µm
UMFR001	Flash Red	3µm	2.50 - 3.50µm
UMGB002	Glacial Blue	6µm	5.50 - 6.50µm
UMDG002	Dragon Green	6µm	5.50 - 6.50µm
UMFR002	Flash Red	6µm	5.50 - 6.50µm
UMGB003	Glacial Blue	8µm	7.50 - 8.50µm
UMDG003	Dragon Green	8µm	7.50 - 8.50µm
UMFR003	Flash Red	8µm	7.50 - 8.50µm

Fluorescent COMPEL come in units of 1mL, 5mL, 10mL or 100mL. (~1% solids 10mg/mL)
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® and BioMag®Plus



BioMag and BioMag Plus are ~1.5µm high-performance superparamagnetic microparticles widely used in assays and for the efficient separation of cells and purification of proteins or other biomolecules. Their irregular morphology provides much greater surface area than similarly-sized spherical particles, resulting in high binding capacities and efficient capture of target with conservative use of particles. The high iron oxide content allows for rapid and efficient magnetic separations, even from difficult, e.g. highly viscous, samples. BioMag Plus particles undergo additional processing for reduction of fines.

Composition	Silanized iron oxide
Morphology	Cluster, irregular
Surface Functionalities	COOH, NH_2, streptavidin, antibodies, and other affinity binding proteins
Density (g/cm³)	> 2.5
Iron Oxide Content (%)	> 90
Magnetization (emu/g)	~ 25 – 35
Surface Area (m²/g)	> 100
Particles / mg	~ 1 x 10^8

Functionalized BioMag®

BioMag are offered in carboxyl and amine functionalized versions to support covalent binding strategies. Covalent coatings offer the highest stability and opportunities to tailor the immobilization chemistry using specialized linkers. See website for specific product data sheets.

Catalog Number	Description	Concentration	Unit size
BM546	BioMag Amine	50 mg/mL	10mL or 100mL
BM545	BioMag Magnetic Amine Immobilization Kit*	50 mg/mL	10mL (1 reaction x 10mL)
BP617	BioMag Plus Amine	50 mg/mL	10mL or 100mL
BP610	BioMag Plus Amine Protein Coupling Kit*	50 mg/mL	10mL (5 reactions x 2mL)
BM570	BioMag Carboxyl	20 mg/mL	10mL or 100mL
BP618	BioMag Plus Carboxyl	20 mg/mL	10mL
BP611	BioMag Plus Carboxyl Protein Coupling Kit*	20 mg/mL	2.5mL (5 reactions x 0.5mL)

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

MAGNETIC MICROSPHERES & PARTICLES

BioMag® Maxi

BioMag Maxi have the same irregular morphology and composition as standard BioMag products, but with a larger mean diameter of ~3 – 12µm. See PDS 630 and PDS 640.

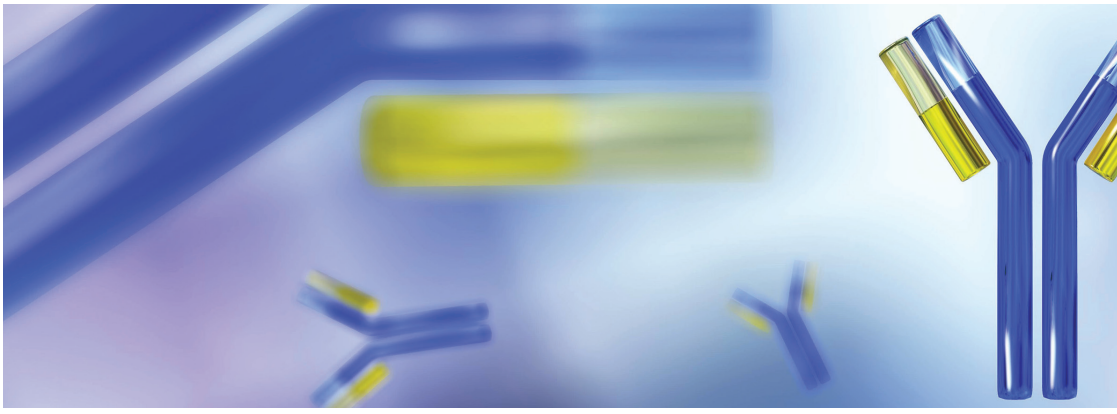
Catalog Number	Description	Concentration	Unit size
BMM30	BioMag Maxi Carboxyl	20 mg/mL	10mL
BMM40	BioMag Maxi Amine	50 mg/mL	10mL

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® for Affinity Ligand Binding

BioMag particles with affinity binding proteins may be coated with their affinity binding partner through a straightforward incubation. They are also suitable for off-the-shelf use in applications such as immunoprecipitation or PCR product clean-up.

Ligand	Binding Partner	Strength
Streptavidin	Biotin	10^{13}
Biotin	Streptavidin	10^{13}
Protein A	Fc region of IgG, species and isotype specific	Varies, see chart on page 31
Protein G	Fc region of IgG, species and isotype specific	Varies, see chart on page 31
Concanavalin A	Mannosyl- and glucosyl-containing glycoproteins and polysaccharides	10^{6} – 10^{7}
Wheat Germ Agglutinin	N-acetylglucosamine-containing glycoproteins and polysaccharides	10^{3} – 10^{7}



BioMag® Streptavidin and BioMag® Biotin

The streptavidin / biotin system offers one of the most straightforward and secure non-covalent coating strategies, and is commonly used to bind or capture labeled antibodies, oligonucleotides, peptides, and protein complexes. See website for specific product data sheets.

Catalog Number	Description	Concentration	Unit size
BM551	BioMag Streptavidin	5 mg/mL	5mL or 50mL
BP628	BioMag Plus Streptavidin	5 mg/mL	10mL
BM568	BioMag Streptavidin, Nuclease-free	1 mg/mL	10mL 25mL or 100mL
BP621	BioMag Plus Streptavidin / Biotin Binding Kit* (suitable for various biotinylated molecules)	5 mg/mL	5 x 1mL
BM552	BioMag Biotin	20 mg/mL	10mL or 100mL

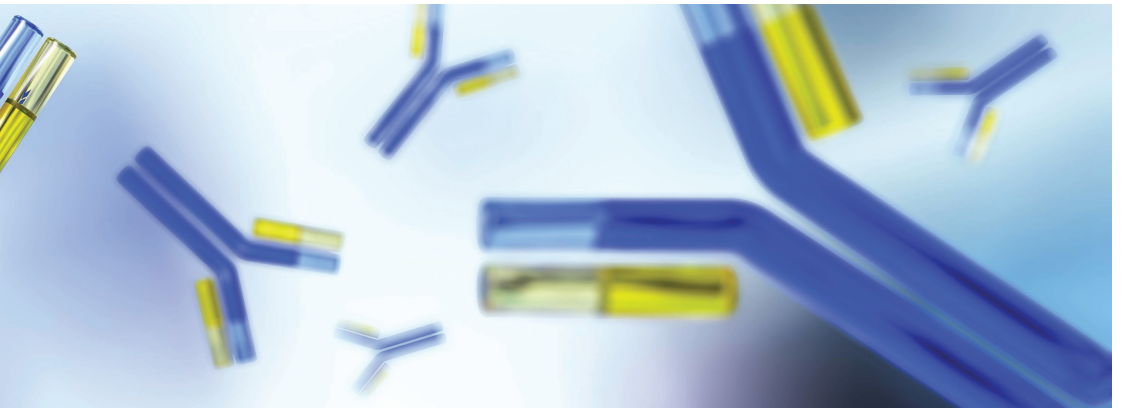
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® for Fc-Antibody Binding

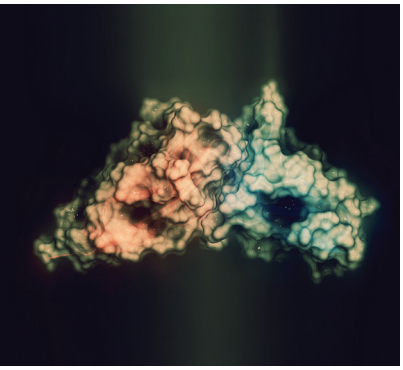
Fc-binding proteins such as Protein A and Protein G offer directed immobilization for a full complement of IgG subclasses from various hosts. They also find routine use for antibody purifications and serum sample preparation. See website for specific product data sheets.

Catalog Number	Description	Concentration	Unit size
BM554	BioMag Protein A	5 mg/mL	2mL or 10mL
BP620	BioMag Plus Protein A	5 mg/mL	2mL or 10mL
BP614	BioMag Plus Protein A Antibody Isolation Kit*	5 mg/mL	2.5 mL (5 reactions x 0.5mL)
BM553	BioMag Protein G	5 mg/mL	2mL or 10mL
BP627	BioMag Plus Protein G	5 mg/mL	2mL or 10mL
BP626	BioMag Plus Protein G Antibody Isolation Kit*	5 mg/mL	2.5 mL (5 reactions x 0.5mL)

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



MAGNETIC MICROSPHERES & PARTICLES

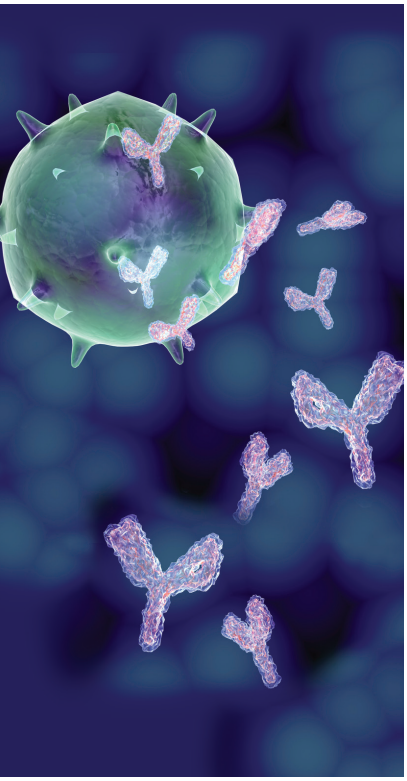


BioMag® Lectin

Lectins including Concanavalin A and Wheat Germ Agglutinin have specific sugar binding partners that can be exploited for the immobilization of saccharides, which commonly lack functional groups needed for covalent binding. See PDS 716 and PDS 720.

Catalog Number	Description	Concentration	Unit size
BP531	BioMag Plus Concanavalin A	5 mg/mL	3mL or 10mL
BP530	BioMag Plus Wheat Germ Agglutinin	5 mg/mL	3mL or 10mL

Please see BangsLabs.com for pricing or contact a local agent.



BioMag® Secondary Antibody

BioMag secondary antibody particles are used extensively in the capture of immune complexes for immunoprecipitation and antibody-labeled cells for indirect cell separation. Secondary antibody coatings also afford a convenient method for binding specific primary antibodies to BioMag particles. See website for specific product data sheets.

Catalog Number	Description	Concentration	Unit size
BM563	BioMag anti-Human IgG	1 mg/mL	50mL
BM562	BioMag anti-Human IgG (Fc)	5 mg/mL	50mL
BM561	BioMag anti-Human IgM	1 mg/mL	50mL
BM549	BioMag anti-Mouse IgG	1 mg/mL	50mL or 500mL
BM550	BioMag anti-Mouse IgG (Fc)	5 mg/mL	50mL or 500mL
BP619	BioMag Plus anti-Mouse IgG	1 mg/mL	50mL
BP612	BioMag Plus anti-Mouse IgG Antibody Coupling Kit*	1 mg/mL	25mL
BM558	BioMag anti-Mouse IgM	1 mg/mL	50mL or 500mL
BM559	BioMag anti-Rabbit IgG	1 mg/mL	50mL or 500mL
BM560	BioMag anti-Rat IgG	1 mg/mL	50mL or 500mL
BM548	BioMag anti-Rat IgG (Fc)	5 mg/mL	50mL or 500mL
BM557	BioMag anti-Rat IgM	5 mg/mL	50mL or 500mL

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Dextran-Coated Charcoal

BioMag Dextran-coated Charcoal is suitable for the adsorption of free tritium-labeled analyte in typical competitive radioimmunoassays. BioMag particles are coated with NORIT® activated carbon and dextran. See PDS 555.

Catalog Number	Description	Concentration	Unit size
BM555	BioMag Dextran-coated Charcoal	5 mg/mL	100mL
BP530	BioMag Dextran-coated Charcoal Concentrate	50 mg/mL	1000mL

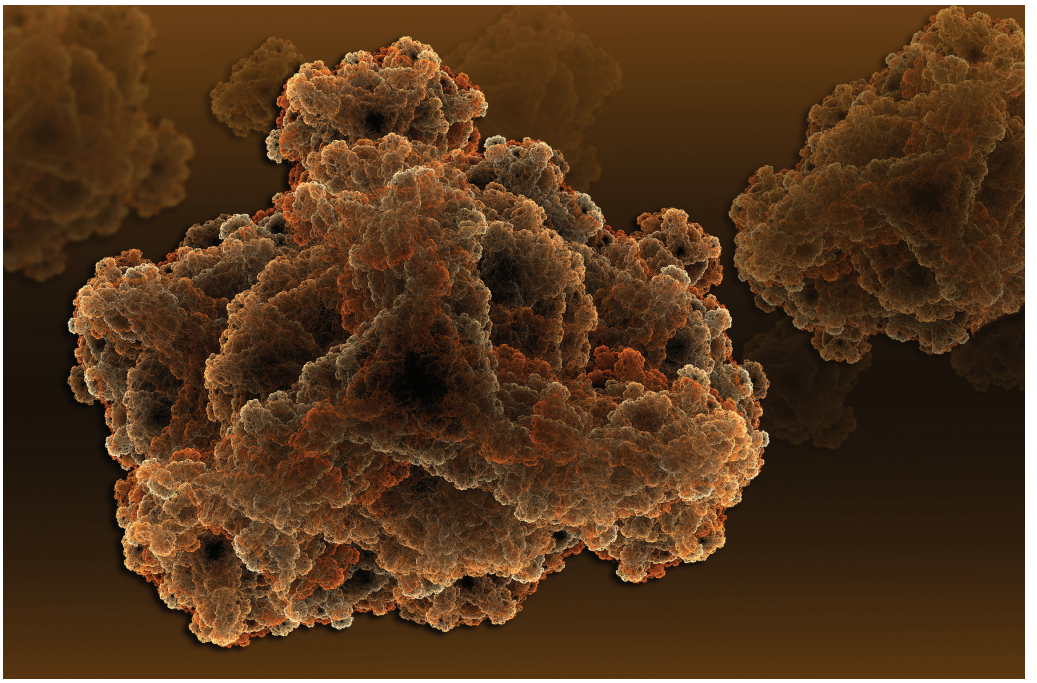
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Superparamagnetic Iron Oxide

BioMag Superparamagnetic Iron Oxide may be used for applications in which a plain iron oxide particle is required. Particles are ~10µm in size, and are non-functionalized. See PDS 547.

Catalog Number	Description	Concentration	Unit size
BM547	BioMag Superparamagnetic Iron Oxide	50 mg/mL	10mL

Please see BangsLabs.com for pricing or contact a local agent.



ACCESSORY REAGENTS & COMPANION PRODUCTS

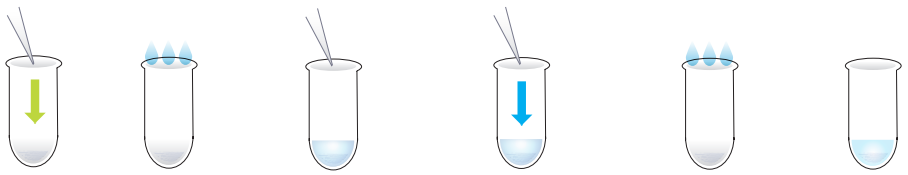
Whether you're just getting started, or are an established laboratory seeking convenience, we have assembled a collection of useful accessory products and implements to assist with your microparticle reagent development and handling efforts. Our offerings include common crosslinking reagents, surfactants, and solutions / buffers for microsphere coating and storage. Our magnetic particle separators and ultrafiltration devices support microparticle washing protocols (see TN 203), while our laboratory rotisserie offers a gentle mixing method for suspension preparation and coating protocol incubations. These products complement our extensive catalog of polymer, silica, and magnetic microparticles, and we hope you find them to be helpful.

COUPLING KITS

Our coupling kits permit the covalent immobilzation of proteins to microparticles. We offer several kits featuring BioMag® superparamagnetic partcles and separations, as well as PolyLink, which may be used with carboxylated polymer or silica microspheres of your choosing. See associated PDS' for protocols and full kits details. See TN205, Covalent Coupling.

PolyLink Protein Coupling Kit

Our PolyLink Protein Coupling Kit is ideal for investigators who are new to microsphere coating, or simply desire the convenience of a kit. The kit is intended for use with carboxyl-functionalized microspheres of 1µm or larger. It contains sufficient EDAC, coupling buffer, and wash / storage buffer for 50 reactions using ~200 – 500µg protein and 12.5mg COOH-functionalized microspheres per reaction. The protocol may be adapted for smaller or larger diameter spheres and our Vivaspin® ultrafiltration devices may be used for wash steps with submicron spheres. See PDS 644.



Catalog Number	Description	# of Reactions
PL01N	PolyLink Protein Coupling Kit*	50 x 12.5mg microspheres*

* Microspheres and protein are not included in the kit. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Magnetic Immobilization Kit

The BioMag Magnetic Immobilization Kit is designed to introduce the user to particle coating using BioMag Amine particles and glutaraldehyde. The kit contains sufficient reagents for 1 x 10mL coupling reaction. See PDS 546.

Catalog Number	Description	Concentration	Unit size
BM545	BioMag Amine Magnetic Immobilization Kit*	50 mg/mL	10mL (1 reaction x10mL)

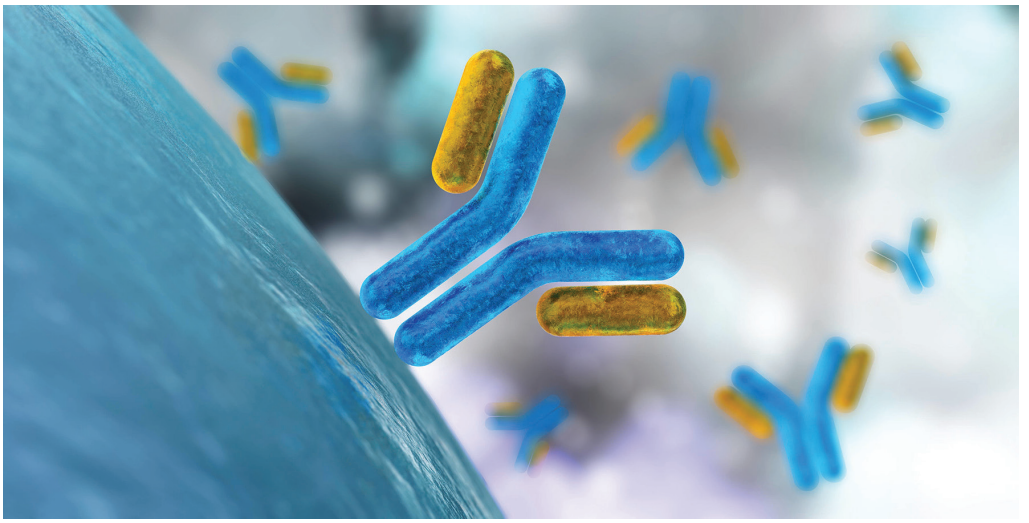
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag®Plus Protein Coupling Kits

The BioMag Plus Protein Coupling Kits are intended for the covalent coupling of proteins to BioMag Plus superparamagnetic particles. The Protein Coupling Kits feature either BioMag Plus Amine or BioMag Plus Carboxyl particles, a chemical crosslinker (glutaraldehyde or EDAC), conical centrifuge tubes, two wash buffers, the quenching solution, and a BioMag MultiSep Magnetic Separator. See PDS 617 and 618.

Catalog Number	Description	Concentration	Unit size
BP610	BioMag Plus Amine Protein Coupling Kit*	50 mg/mL	10mL (5 reactions x 2mL)
BP611	BioMag Plus Carboxyl Protein Coupling Kit*	20 mg/mL	2.5mL (5 reactions x 0.5mL)

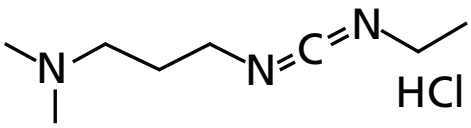
* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



ACCESSORY REAGENTS & COMPANION PRODUCTS

COUPLING REAGENTS

Our crosslinking reagents for microsphere coating offer a convenient means to replenish individual components of coupling kits. See PDS 740.

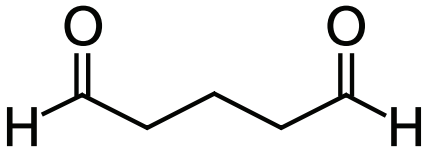


DEPC-Carbodiimide (EDAC)

EDAC is a zero-length crosslinker that is routinely used for the covalent binding of amine-containing ligands to carboxylated microspheres. Sample protocols are provided in TN 205, Covalent Coupling, 302, Molecular Biology, and PolyLink PDS 644.

Catalog Number	Description	Unit size
AA010	DEPC-Carbodiimide (EDAC)	1g or 5g

Please see BangsLabs.com for pricing or contact a local agent.



Glutaraldehyde, EM Grade, 25%

Glutaraldehyde is a homobifunctional linker that is suitable for binding amine-containing ligands to amine-modified beads. We supply EM (electron microscopy) grade glutaraldehyde in ampoules to ensure highest activity. Each vial is fitted with an ampoule cracker for added safety.

Catalog Number	Description	Unit size
AA012	Glutaraldehyde, EM Grade, 25%	10 x 10 mL (ampoules)

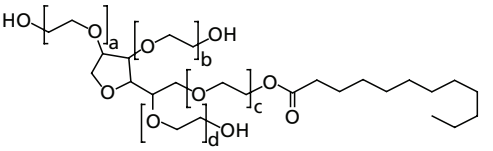
Please see BangsLabs.com for pricing or contact a local agent.

SURFACTANTS

Surfactants are commonly utilized with microspheres composed of hydrophobic polymer matrices such as polystyrene to facilitate bead wetting and deter or treat aggregation. Common concentrations are ~0.1% for uncoated polymer beads, and ~0.01 - 0.05% in the storage buffer of coated polymer, magnetic, and silica beads. The type and concentration of surfactant should be optimized to achieve best performance. As surfactant associates with the bead surface, it is washed out prior to bead coating or use of the coated microsphere reagent to avoid interference with binding reactions. See PDS 739.

Tween® 20 Nonionic Surfactant

Tween® 20 is a nonionic surfactant. It is often used in the storage buffers of coated bead suspensions (~0.01 - 0.05%). Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%).

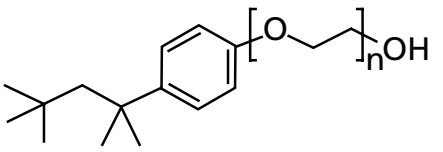


Catalog Number	Description	Unit size
AA016	Tween® 20	10g

Please see BangsLabs.com for pricing or contact a local agent.

Triton™ X-100 Nonionic Surfactant

Triton™ X-100 is a nonionic surfactant. It is often used in the storage buffers of coated bead suspensions (~0.01 - 0.05%). Very low concentrations may be used in wash or binding buffers if needed (e.g. 0.0005%).

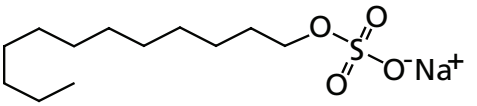


Catalog Number	Description	Unit size
AA014	Triton™ X-100	10g

Please see BangsLabs.com for pricing or contact a local agent.

Sodium Dodecyl Sulfate (SDS) Anionic Surfactant

Sodium dodecyl sulfate (SDS) is an anionic surfactant, which will decrease polymer bead hydrophobicity and can additionally participate in charge stabilization of the suspension. SDS is a more rigorous surfactant that is commonly used in uncoated polymer bead preparations. (~0.1%)



Catalog Number	Description	Unit size
AA018	SDS	10g

Please see BangsLabs.com for pricing or contact a local agent.

ACCESSORY REAGENTS & COMPANION PRODUCTS

BUFFERS AND SOLUTIONS

Bangs Bead Solution

Bangs Bead Solution is a ready-to-use aqueous suspending solution for the dilution and / or storage of your uncoated plain, dyed, or functionalized polymer or magnetic microspheres. An antimicrobial agent deters microbial contamination, and stabilizers promote dispersity. See PDS 738.

Catalog Number	Description	Unit size
SOLN1	Bangs Bead Solution	500mL, 1000mL, or 2000mL

Please see BangsLabs.com for pricing or contact a local agent.

Bangs Bead Coupling Buffers

Bangs Bead Coupling Buffers are ready-to-use buffers that are available in a variety of pH levels (4.5 to 9.0). They can be used as coupling or wash buffers for polymer, silica, or magnetic microspheres. See PDS 738.

Catalog Number	Description	pH	Unit size
BUFF1	Bangs Bead Coupling Buffer	4.5	250mL, 500mL, 1000mL or 2000mL
BUFF2	Bangs Bead Coupling Buffer	6.0	250mL, 500mL, 1000mL or 2000mL
BUFF3	Bangs Bead Coupling Buffer	7.4	250mL, 500mL, 1000mL or 2000mL
BUFF4	Bangs Bead Coupling Buffer	9.0	250mL, 500mL, 1000mL or 2000mL

Please see BangsLabs.com for pricing or contact a local agent.

Bangs Bead Storage Buffers

Our storage buffers are available in two pH levels: 7.4 and 8.5, and contain stabilizers for long-term stability of coated bead suspensions. See PDS 738.

Catalog Number	Description	pH	Unit size
BUFF5	Bangs Bead Storage Buffer	7.4	250mL, 500mL, 1000mL or 2000mL
BUFF6	Bangs Bead Storage Buffer	8.5	250mL, 500mL, 1000mL or 2000mL

Please see BangsLabs.com for pricing or contact a local agent.

STAINS

Trypan Blue

Trypan blue exclusion is a common method for the determination of cell viability. It is used extensively in biopharmaceutical cell culture programs, and for a range of research studies including apoptosis, cytopathic effects of viral infection, and effects of sample processing methods on cell viability and concentration. Our trypan blue solution is suitable for traditional manual staining and hemocytometer counting. See PDS 748.

Catalog Number	Description	Unit size
AA020	Trypan Blue 0.4% Solution	125mL
AA021	Trypan Blue 0.4% Solution	250mL

Please see BangsLabs.com for pricing or contact a local agent.

EQUIPMENT

MAGNETIC SEPARATORS

Superparamagnetic particles have been utilized extensively in diagnostics and other research applications for the isolation of cells and biomolecules such as antibodies, nucleic acids, and polypeptides. The biomagnetic separators available from Bangs Laboratories accommodate a complete range of magnetic separation applications, including cell sorting, mRNA and DNA isolation, and the purification of biomolecules.

Our biomagnetic separators feature high-energy neodymium-iron-boron [Nd-Fe-B] magnets that ensure fast separation rates, excellent wall or well retention, and maximum yield. They are suitable for use with all of our magnetic microparticle product lines.

1.5mL Magnetic Separator

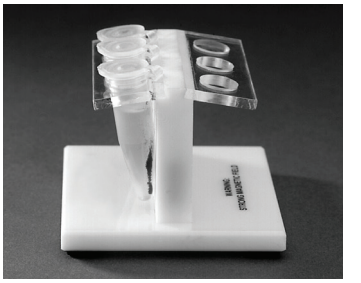
The 1.5mL Magnetic Separator is a durable plastic magnetic separation unit designed to accommodate a standard 1.5mL microcentrifuge tube for research scale magnetic separations. Upon placement of the tube on the separator, the magnet will quickly draw superparamagnetic particles to the wall of the tube and out of the solution. Once separation is complete, with particles held firmly to the wall, the supernatant may be removed. The 1.5mL Magnetic Separator is simple and easy to use with most established bead protocols. See PDS 700.

Catalog Number	Description	Capacity
LS001	1.5mL Magnetic Separator	1 – 1.5mL microcentrifuge tube

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Multi-6 Microcentrifuge Tube Separator

The BioMag Multi-6 Microcentrifuge Tube Separator is a durable plastic magnetic separation unit designed to accommodate six 1.5mL microcentrifuge tubes. The magnets and tube holders are positioned to efficiently separate particles from microliter volumes common in molecular biology applications. See PDS 576.

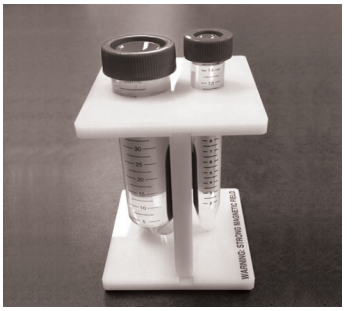


Catalog Number	Description	Capacity
MS002	BioMag Multi-6 Microcentrifuge Tube Separator	6 x 1 – 1.5mL microcentrifuge tubes

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® MultiSep Magnetic Separator

One magnetic separator that can be used for different tube sizes is a convenient and economical alternative to having a specific magnetic separator for each tube size. The MultiSep can be used with 50mL, 15mL, or 1.5mL centrifuge tubes and has a simple robust design. The MultiSep is well suited for those labs that do not need to perform simultaneous magnetic particle separations. See PDS 598.

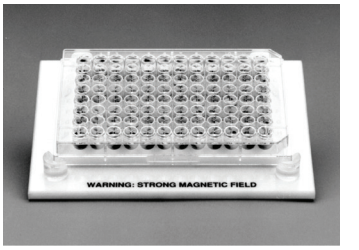


Catalog Number	Description	Capacity
MS001	BioMag MultiSep Separator	1.5mL, 15mL, or 50mL centrifuge tubes

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® 96-Well Plate Separator

The BioMag 96-Well Plate Separator (bottom pull) is a durable magnetic separation unit designed to accommodate most 96-well plates. The magnetic separator consists of permanent magnets enclosed in a plastic frame. See PDS 575.



Catalog Number	Description	Capacity
MS003	BioMag 96-Well Plate Separator	96-well plate (bottom pull)

Please see BangsLabs.com for pricing or contact a local agent.

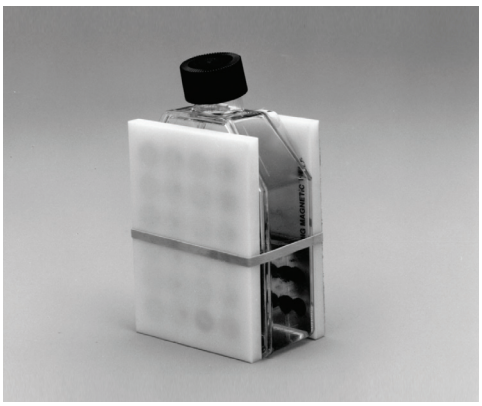
EQUIPMENT

BioMag® 96-Well Plate Side Pull Separator

The BioMag 96-Well Plate Side Pull Separator is a durable magnetic separation unit designed to accommodate 96-well plates that allow the magnetic pins to fit between the individual wells. This separator allows particles to be pulled to the sides, giving access to the bottom of the wells for more complete fluid removal and less chance of particle aspiration. The magnetic separator consists of 24 permanent neodymium-iron-boron rod magnets embedded in a plastic frame. See PDS 575A.

Catalog Number	Description	Capacity
MS005	BioMag 96-Well Plate Side Pull Separator	96-well plate (side pull)

Please see BangsLabs.com for pricing or contact a local agent.



BioMag® Flask Separator

The BioMag Flask Separator is one 12.5cm x 6cm rectangular magnetic separation unit designed for use with tissue culture flasks. Test tubes may be used with this unit by securing them against the magnet with a rubber band. The unit consists of permanent magnets encased in a plastic frame. See PDS 703.

Catalog Number	Description	Capacity
MS004	BioMag Flask Separator	tissue culture flask / test tubes

Please see BangsLabs.com for pricing or contact a local agent.

OTHER EQUIPMENT

Vivaspin® Ultrafiltration Device

Vivaspin® Concentrators are disposable ultrafiltration devices that may be utilized for the washing and concentration of submicron (20 nm - 0.5µm) microspheres. Vivaspin® present an excellent (fast, easy, economical) alternative to dialysis or more laborious/wasteful filtration devices. See PDS AA022.

Catalog Number	Description	Capacity
AA022	Vivaspin® 2 mL Ultrafiltration device	2mL × 5 units

Please see BangsLabs.com for pricing or contact a local agent.

Tube Rotator

Bangs' Tube Rotator features a removable shaft assembly with polypropylene holders for rotating bottles and tubes. (Supplied with 110 volt power cord. Used in U.S. & Canada) See PDS 699.

Catalog Number	Description	Capacity
ROTAT	Tube Rotator	configurable

Please see BangsLabs.com for pricing or contact a local agent.

CUSTOM & OEM SERVICES

Capability

Bangs Laboratories' 30 years of experience in microsphere synthesis and fine particle analysis have established us as a leading supplier of polymer, silica and magnetic microspheres to diagnostic companies and instrument manufacturers. We understand what it takes to get new assays and instruments to market, and we have the products and the know-how to support you in your development process. We manufacture at scales that will carry you from R&D through production, and under an ISO 13485:2016 Quality System that will meet your regulatory needs.

Our specialty products for instrument standardization and bioseparations speak to our dyeing, coating, and surface modification capabilities. We are also pleased to offer custom formulations, concentrations, and packaging for our OEM customers.

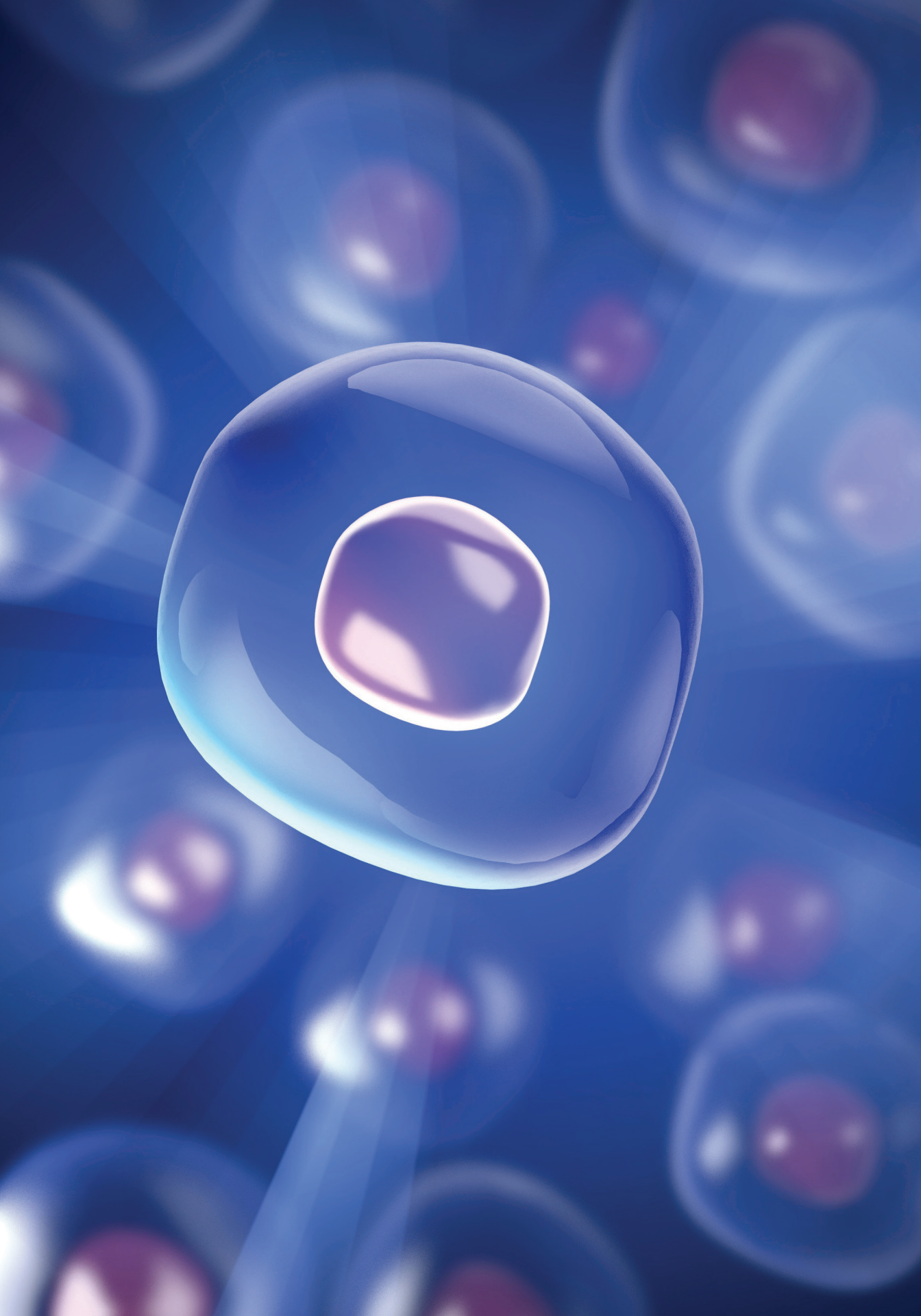
Quality

Product quality and customer satisfaction are corporate imperatives, and our Quality Management System has been certified to comply with ISO 13485:2016. In addition to maintaining a rigorous adherence to our own quality objectives, we work closely with our customers to ensure that we fully capture your unique product specifications and any other quality requirements.

Support

Client relationships are extremely important to us, and extend far beyond the scope of a given order or project. Our customer and technical support never expire - we are committed to you from initial discussions through the product lifecycle and beyond.

We welcome inquiries regarding these and other types of projects. Please contact us to learn how we may be of assistance in formulating solutions to meet your specific requirements.



MAGNETIC BIOSEPARATIONS

Magnetic microparticles offer a highly convenient means to conduct a variety of bioseparations. Particles may be coated with antibodies, lectins, or oligonucleotides to effect separations of specific cell populations or target sequences, and kits and protocols are available for nonspecific or targeted isolations. We offer a broad range of magnetic particle-based kits and specific coatings for the enrichment of cell populations, depletion of abundant proteins from serum, and isolation of glycoproteins and nucleic acids.

Many of our bioseparation products are based on BioMag® and BioMag®Plus magnetic particle technology. The irregular morphology affords much greater surface area than that of similarly sized spherical particles, resulting in high capture efficiency with conservative use of particles.

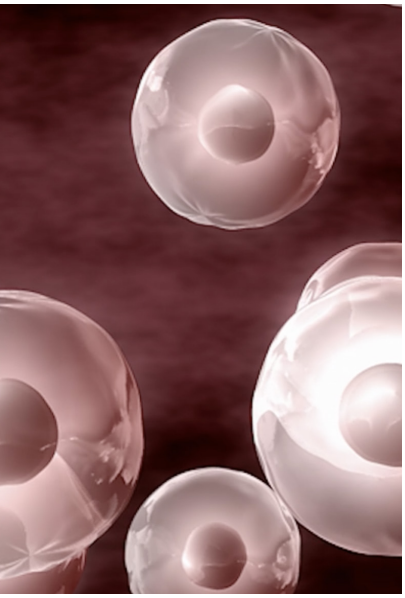
We also offer several types of affinity ligand coated and carboxylated magnetic particles for customizable and general isolations, including streptavidin particles for biotinylated oligos and Magnefy™ COOH for SPRI-based nucleic acid isolation.

Separation	
Antibodies	BioMag® Protein A or Protein G and ProMag® Protein G
Proteins	BioMag®, ProMag®, ProMag® HP or COMPEL
Glycans, glycoproteins	BioMag® WGA or ConA
Cells	BioMag® anti-CD marker or secondary antibody
Subcellular organelles	BioMag® (antibody-coated)
Immunoprecipitates	BioMag® secondary antibody
mRNA	BioMag® Oligo dT(20) or mRNA Purification System
DNA (total-SPRI)	Magnefy™ or BioMag® COOH
DNA (specific sequence)	ProMag® ProMag® HP, Magnefy™, COMPEL™, or BioMag® Streptavidin or COOH (oligo attachment)
Biopanning	ProMag®, COMPEL™, or BioMag®

CELL SEPARATIONS

BioMag® anti-Leukocyte for Human or Mouse

BioMag anti-Leukocyte particles are coated with anti-CD antibodies for the selection of specific cell subsets from purified leukocyte preps or whole blood. Positive selections permit rapid and efficient isolation of target cell populations. Cocktails of BioMag anti-CD particles may be developed for use in negative selections. See website for specific product data sheets.



Catalog Number	Description	Concentration	Unit size
BM595	BioMag anti-Human CD2	4 mg/mL	5mL
BM581	BioMag anti-Human CD4	1.5 mg/mL	5mL
BM583	BioMag anti-Human CD8	1.5 mg/mL	5mL
BM596	BioMag anti-Human CD11b	1 mg/mL	5mL
BM584	BioMag anti-Human CD14	1.5 mg/mL	5mL
BM586	BioMag anti-Human CD19	4 mg/mL	5mL
BM587	BioMag anti-Human CD34	4 mg/mL	5mL
BM588	BioMag anti-Human CD45	4 mg/mL	5mL
BM589	BioMag anti-Human CD56	4 mg/mL	5mL
BM590	BioMag anti-Human CD71	4 mg/mL	5mL
BM592	BioMag anti-Mouse CD4	1 mg/mL	5mL
BM593	BioMag anti-Mouse CD8a	1 mg/mL	5mL
BM594	BioMag anti-Mouse CD45R	1 mg/mL	5mL

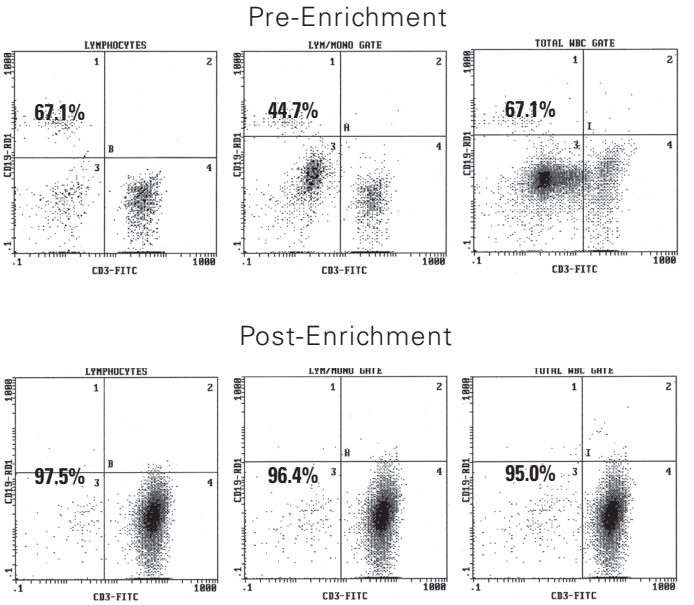
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Human T cell Enrichment Systems

BioMag Human T cell Enrichment Systems are available for the enrichment of CD3+, CD4+, or CD8+ T cell fractions from human peripheral blood mononuclear cells. These systems involve the magnetic removal of subpopulations positive for other CD markers, leaving the untouched CD3+, CD4+, or CD8+ fractions for analysis. See PDS 597.

Catalog Number	Description	Concentration	Unit size
BM597	BioMag Human CD3+ T cell Enrichment System	1 mg/mL	1mL or 5mL
BM598	BioMag Human CD4+ T cell Enrichment System	1 mg/mL	1mL or 5mL
BM599	BioMag Human CD8+ T cell Enrichment System	1 mg/mL	1mL or 5mL

Please see BangsLabs.com for pricing or contact a local agent.



The BioMag Human CD3+ T cell Enrichment System targets removal of CD19+, CD16+, CD14+, CD56+, CD11b+, and CD36+ cells. Particle to target cell ratio = 5.6.

CELL SEPARATIONS

BioMag® Secondary Antibody

BioMag secondary antibody particles are used extensively in the capture of immune complexes for immunoprecipitation and separation of primary antibody-labeled cells. Secondary antibody coatings also afford a convenient method for binding specific primary antibodies to BioMag particles. See website for specific product data sheets.

Catalog Number	Description	Concentration	Unit size
BM563	BioMag Goat anti-Human IgG	1 mg/mL	50mL
BM562	BioMag Goat anti-Human IgG (Fc)	5 mg/mL	50mL
BM561	BioMag Goat anti-Human IgM	1 mg/mL	50mL
BM549	BioMag Goat anti-Mouse IgG	1 mg/mL	50mL or 500mL
BM550	BioMag Goat anti-Mouse IgG (Fc)	5 mg/mL	50mL or 500mL
BP619	BioMag Plus Goat anti-Mouse IgG	1 mg/mL	50mL
BP612	BioMag Plus Goat anti-Mouse IgG Antibody Coupling Kit*	1 mg/mL	25mL
BM558	BioMag Goat anti-Mouse IgM	1 mg/mL	50mL or 500mL
BM559	BioMag Goat anti-Rabbit IgG	1 mg/mL	50mL or 500mL
BM560	BioMag Goat anti-Rat IgG	1 mg/mL	50mL or 500mL
BM548	BioMag Goat anti-Rat IgG (Fc)	5 mg/mL	50mL or 500mL
BM557	BioMag Goat anti-Rat IgM	5 mg/mL	50mL or 500mL

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag®Plus Mouse anti-Fluorescein IgG

BioMag Plus Mouse anti-Fluorescein IgG particles may be used to isolate fluorescein-tagged species such as labeled cells or nucleic acids. See PDS 622.

Catalog Number	Description	Concentration	Unit size
BP622	BioMag Plus Mouse anti-Fluorescein IgG	1 mg/mL	50mL

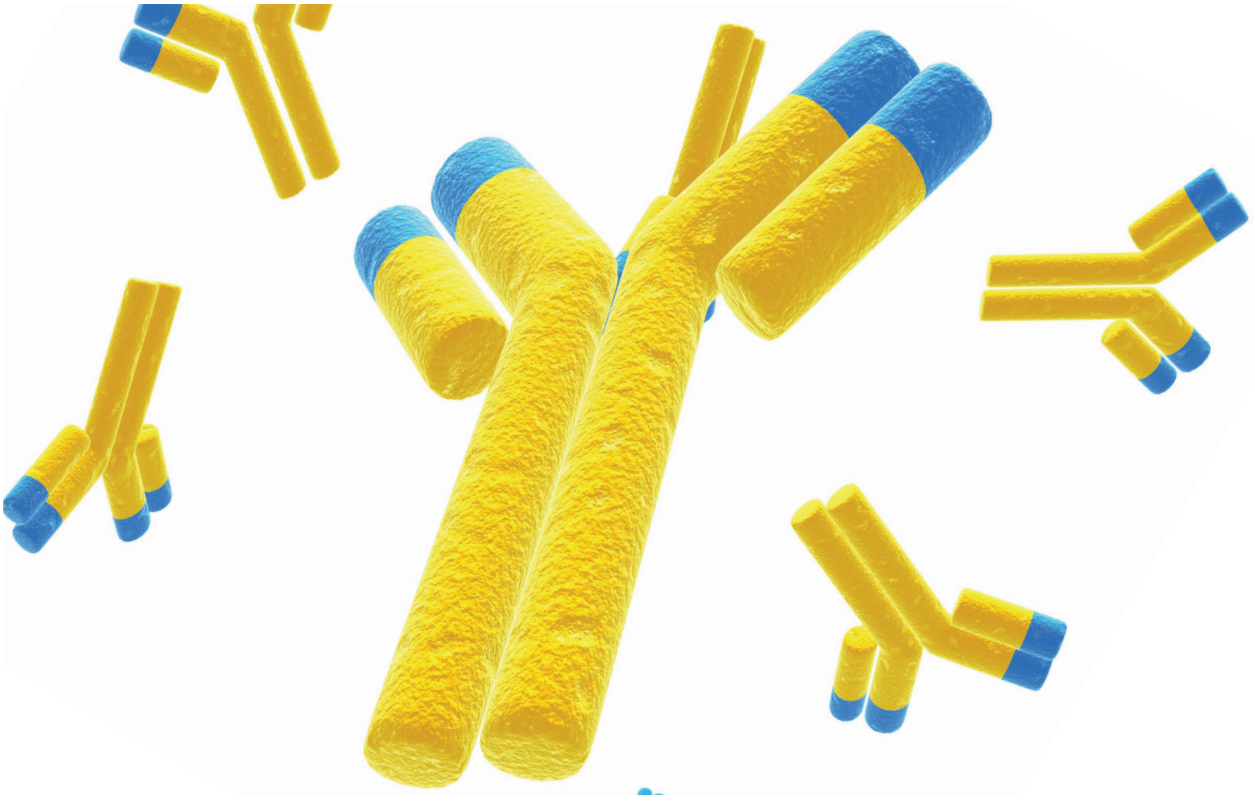
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Protein A and Protein G

Bangs offers BioMag Plus Protein A or Protein G particles and Isolation Kits for the isolation of antibody-labeled cells or the recovery of antibodies from serum and cell culture supernatants. BioMag Plus Protein A or Protein G are also suitable for binding immunoglobulins, as an effective adsorbent for removal of Fc fragments during Fab fragment preparation, and in immunoassay systems. See website for specific product data sheets.

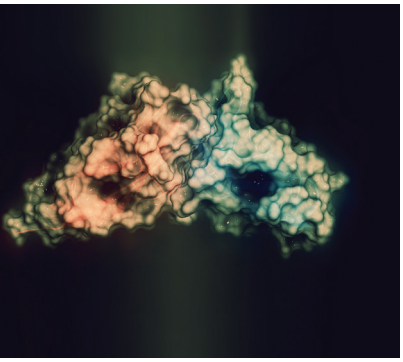
Catalog Number	Description	Concentration	Unit size
BM554	BioMag Protein A	5 mg/mL	2 or 10mL
BP620	BioMagPlus Protein A	5 mg/mL	2 or 10mL
BP614	BioMag Plus Protein A Antibody Isolation Kit*	5 mg/mL	2.5mL
BM553	BioMag Protein G	5 mg/mL	2 or 10mL
BP627	BioMag Plus Protein G	5 mg/mL	2 or 10mL
BP626	BioMag Plus Protein G Antibody Isolation Kit*	5 mg/mL	2.5mL

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.



GLYCANS / GLYCOPROTEINS

Our ConA- and WGA-coated BioMag Plus microparticles provide a convenient means for isolating glycoproteins from serum or cell lysate, and for investigating other lectin / glycan-mediated processes. The BioMag Plus magnetic particle format provides high surface area, and permits easy and efficient separations.



BioMag®Plus Concanavalin A

Concanavalin A (Con A) is a 104,000 Da protein comprised of four identical subunits, and exists as an active dimer or tetramer depending upon pH. Its carbohydrate binding partners are α-D-glucose and α-D-mannose with unmodified OH groups at C-3, C-4, and C-6, and terminal glucose residues of proteins and peptides. The unique saccharide-binding properties of Concanavalin A have made it useful for the labeling and isolation of glycan-presenting cells and glycoproteins in serum and cell lysate. Lectins have additionally been used in cell adhesion studies, to effect lymphocyte activation, and to explore carbohydrate-based therapeutics. See PDS 720.

Catalog Number	Description	Concentration	Unit size
BP531	BioMag Plus Concanavalin A	5 mg/mL	3mL or 10 mL

Please see BangsLabs.com for pricing or contact a local agent.

BioMag®Plus Wheat Germ Agglutinin

Wheat germ *(Triticum vulgaris)* agglutinin (WGA) is a 36,000 Da protein comprised of two identical subunits. Its primary sugar-binding partner is N-acetylglucosamine (GlcNAc), and it binds most securely to GlcNAc dimers and trimers. WGA is a binder of gram-positive bacteria, via GlcNAc moieties in the peptidoglycan layer of the cell wall. WGA also interacts with saccharides with terminal GlcNAc, chitobiose, or sialic acid residues. WGA does not contain protein-bound carbohydrate, and is not blood group specific. See PDS 716.

Catalog Number	Description	Concentration	Unit size
BP530	BioMag Plus Wheat Germ Agglutinin	5 mg/mL	3mL or 10 mL

Please see BangsLabs.com for pricing or contact a local agent.

BioMag® and BioMag®Plus superparamagnetic microparticles are utilized in the magnetic separation of nucleic acids. The irregular shape of BioMag and BioMag Plus particles affords a much greater surface area than that of the same size spherical particles. This large surface area results in high binding capacities, allowing efficient target capture with minimal amounts of particles. Additionally, their greater than 90% iron oxide content allows for faster magnetic separations, especially on automated high throughput platforms. *Note: See other SA supports in the Test Developer Section.*

BioMag® Streptavidin

Bangs offers streptavidin-coated magnetic particles in our BioMag and BioMag Plus product lines. A BioMag Plus Streptavidin / Biotin Binding Kit for the attachment of biotinylated proteins to BioMag Plus superparamagnetic particles is also available. See PDS 551 and PDS 621.

Catalog Number	Description	Concentration	Unit size
BM551	BioMag Streptavidin	5 mg/mL	5 or 50mL
BP628	BioMag Plus Streptavidin	5 mg/mL	10mL
BP621	BioMag Plus Streptavidin / Biotin Binding Kit* (suitable for biotinylated molecules)	5 mg/mL	5mL

* Kit is provided with a magnetic separator. Please see BangsLabs.com for pricing or contact a local agent.

BioMag® Streptavidin, Nuclease-free

Streptavidin-coated BioMag particles are offered as a nuclease-free preparation for the binding or capture of biotinylated nucleic acids. See PDS 530.

Catalog Number	Description	Concentration	Unit size
BM568	BioMag Streptavidin, Nuclease-free	1 mg/mL	10mL, 25mL, or 100mL

Please see BangsLabs.com for pricing or contact a local agent.

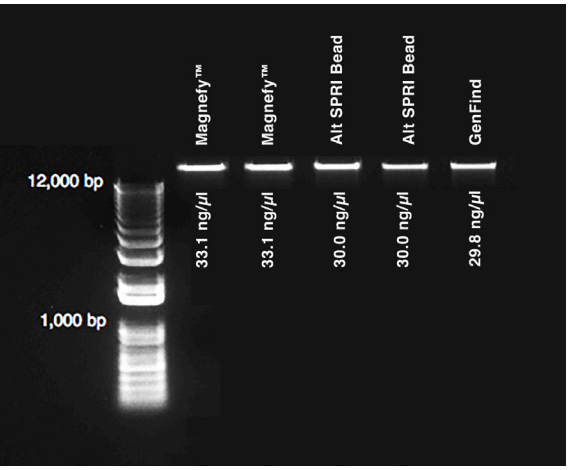
BioMag® mRNA Purification System & BioMag® Oligo dT

Nuclease-free suspensions of BioMag with covalently-bound oligo dT(20) are utilized for the efficient isolation of polyadenylated mRNA from total RNA, tissue or cell lysate. Following isolation, mRNA is eluted through a simple incubation in DEPC-treated water. BioMag Oligo dT(20) particles may be purchased alone or as a component of our BioMag mRNA Purification System. See PDS 569.

Catalog Number	Description	Concentration	Unit size	# of Reactions
BM569	BioMag mRNA Purification System Featuring BioMag Oligo dT(20), Nuclease-free particles	5 mg/mL	2mL	20 x 100µg total RNA; or 10 x 50–100mg tissue; or 10 x lysate from $5x10^6$ cells
BM529	BioMag Oligo dT(20), Nuclease-free	5 mg/mL	2mL	20 x 100µg total RNA

Please see BangsLabs.com for pricing or contact a local agent.

NUCLEIC ACIDS



Magnefy™

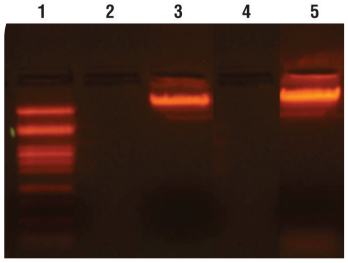
Meet the newest addition to our family of magnetic particles–Magnefy™ ~1µm carboxylated superparamagnetic microspheres. As high surface area / high surface titer microparticles with a rapid separation profile, Magnefy offer an additional performance-driven solid phase for magnetic particle-based assays and isolations, particularly SPRI-based total DNA isolation. See PDS 756.

Catalog Number	Description	Nominal Diameter	Unit size
MFY0002	Magnefy™ COOH	1µm	5mL, 10mL, 25mL , 100mL

(~5% solids 50mg/mL) Please see BangsLabs.com for pricing or contact a local agent.

SNARe™ DNA Purification Systems

SNARe DNA Purification Systems offer rapid, economical methods for isolating DNA. The Purification Systems utilize SNARe DNA Separation Particles—high surface area, superparamagnetic particles with a mean diameter of ~1.5µm. Once bound, the stable DNA-particle complex may be washed to remove impurities and unwanted proteins. Upon elution, the clean DNA preparation is suitable for use in downstream applications such as PCR, labeling, sequencing, transfection, and cloning. See PDS 691, 691A, 692, and 693.



Lane 1: Molecular Weight Standards Lambda DNA PST-1
Lane 2: Blank
Lane 3: Competing Isolation Technology
Lane 4: Blank
Lane 5: SNARe DNA Purification System

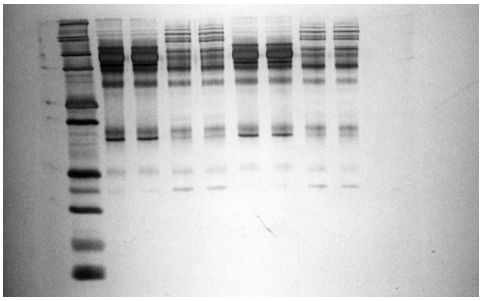
Catalog Number	Description	# of Reactions
BP691	SNARe Whole Blood Genomic DNA Purification System	100 x 200µL whole blood
BP692	SNARe Plasmid DNA Purification System	100 x 1–3mL bacterial culture
BP693	SNARe Plant Genomic DNA Purification System	100 x 50–100mg tissue

Please see BangsLabs.com for pricing or contact a local agent.

Changes that occur in the expression of serum and plasma proteins have long been recognized as a way to investigate and monitor physiological changes. This rich source of information does, however, present challenges for many analytical methods. Specifically, HPLC and mass spectrometry have a limited dynamic range for the amount of protein that can be loaded and resolved. Albumin may represent 50-70% and IgG 10-20% of the total protein in serum, masking the ability to detect proteins that are present at low concentrations. If the majority of these two proteins can be removed from serum samples, a significant improvement in resolution of less abundant proteins can be achieved.

BioMag® ProMax Albumin Removal Kit

The magnetically responsive BioMag® ProMax Albumin Removal Particles supplied in the kit, in combination with specific buffer conditions, allow the binding and release of less abundant proteins in serum, while minimizing the binding of albumin, so that it may be washed away. See PDS 658.



ProMax Albumin Removal Gels

Catalog Number	Description	# of Reactions
BP658	BioMag ProMax Albumin Removal Kit	25 x 10µL Serum

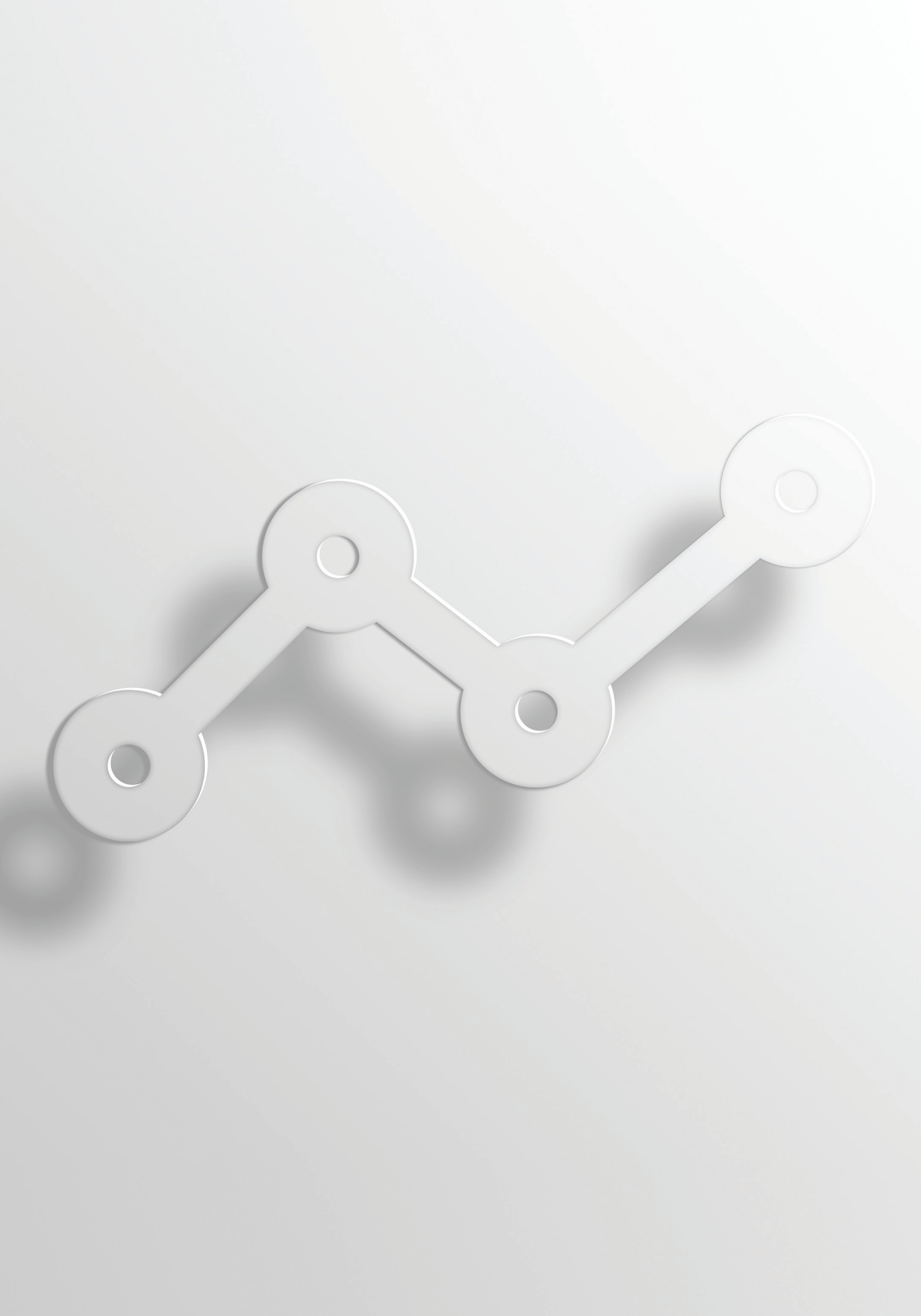
Please see BangsLabs.com for pricing or contact a local agent.

BioMag® ProMax Serum IgG Removal Kit

The ProMax IgG Removal Particles and specific buffer conditions bind IgG from serum, permitting its depletion from the sample. Removal of IgG with the ProMax IgG Removal Kit is a rapid and simple procedure that requires no pretreatment of the sample. In addition, the ProMax system does not require the use of time-consuming columns or centrifugation. The ProMax protocol is scalable and can be used in conjunction with the BioMag® ProMax Albumin Removal Kit. See PDS 659.

Catalog Number	Description	# of Reactions
BP659	BioMag ProMax Serum IgG Removal Kit	10 x 1µL Serum

Please see BangsLabs.com for pricing or contact a local agent.

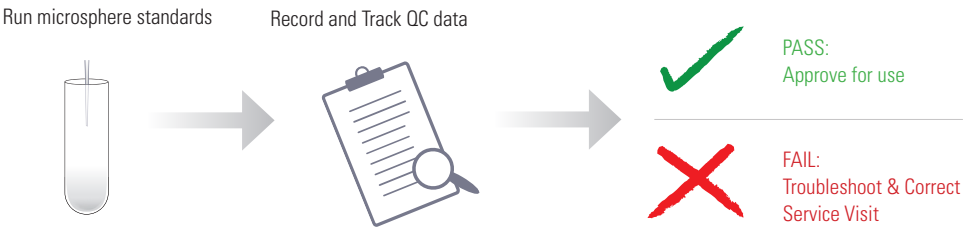


INSTRUMENT STANDARDS

Microsphere standards are essential for defining an instrument's capabilities and limitations in terms of sensitivity, precision and accuracy, and ensuring that it is stable and suitable for use. They aid in understanding the effects of extraneous factors such as temperature, humidity, and electronic noise, and are also important to gage studies and technician training and proficiency programs.

Bangs Laboratories manufactures a comprehensive range of standards for analytical instruments such as cell analyzers, particle sizers, flow cytometers and fluorescence microscopes. Our offerings include NIST Traceable Particle Size Standards, SureCount™ Count Standards, ViaCheck™ Cell Viability and Concentration Controls, in addition to a broad range of fluorescent and antibody capture beads for Flow Cytometry, and fluorescent beads and slides for imaging applications.

We invite you to browse our catalog of instrument standards and associated online technical library, and to contact our technical customer support staff if we can be of help in product selection or to discuss the custom manufacture of a product to meet your unique needs.



FLOW CYTOMETRY QUALITY CONTROL

When designing a flow cytometry QC program, the unique needs of the department or facility should be considered. Some products may satisfy multiple tasks, such as a single bead used for basic daily QC and set-up of dedicated instruments. In other instances, combinations of products may be appropriate to meet the unique requirements of specific studies, or for instruments with shared use.

The below table is intended to provide a framework to aid in product selection for both initial validation and continued management of an instrument. This ensures surveillance of the complete system, i.e. the optics (lasers, detectors, flow cell alignment), fluidics (observation of flow rates, time delay confirmation), and associated computing. Recording and tracking results can confirm satisfactory performance, or aid in identifying both random (electronic noise, air bubbles, etc.) and systemic errors (bias, shifts and trends due to temperature fluctuation, laser deterioration, misalignment, etc.) so that corrective action may be taken.

Please feel free to contact us to discuss what products are available to support the unique requirements of your QC program or study.

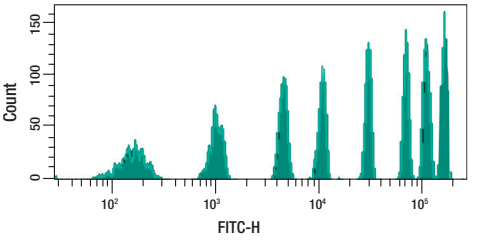
Example of a basic QC program for a 2 laser cytometer

Frequency	Product	Purpose	Coverage	Data
Daily	Full Spectrum (# 885) or Quantum QC (# 725)	Basic check of system; Laser alignment check	All lasers/ detectors	Chart channel values; Record CVs
Daily for quantitative	Quantum MESF (See page 82)	Run at specific PMTs for quantitative expression analyses: Linearity, resolution, detection threshold, alignment	Specific detector	Confirm resolution; Record linearity; Chart detection threshold and CV
Weekly	Quantum QC (#725)	For qualitative analyses; Linearity, resolution, detection threshold, alignment	All lasers/ detectors	Confirm resolution; Record linearity; Chart detection threshold and CV
Weekly	Time Delay Standard (#830) (See page 75)	Time delay check	Delay between laser 1 (488nm) and laser 2 (635nm)	Confirm time delay

Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC. It is appropriate for use with all lasers and detectors and may be used to determine detection thresholds, understand detector resolution, and assess and track linearity. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run.

Quantum™ QC, 8 Peak Beads



Quantum QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. See PDS 725 & 725A for all representative histograms.

Catalog Number	Description	Unit Size
725	Quantum QC, 8 Peak Beads	100 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Full Spectrum™

Full Spectrum™ microspheres provide a convenient means for performing the initial daily QC check on 3-9+ color instruments. The microspheres are internally labeled with multiple fluorophores for use with common excitation and detection wavelengths within the visible spectrum. See PDS 885.

Catalog Number	Description	Unit Size
885	Full Spectrum™	A(20), B (100), C(280) Tests

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY QUALITY CONTROL

Fluorescence Reference Standards

Single-color Fluorescence Reference Standards are labeled with specific fluorochromes to exhibit the same spectral characteristics as labeled cells. These standards may be used to QC a specific path of the optical system (laser / filter / PMT), to optimize filter and mirror sets for fluorophores, and to establish a test-specific Target Channel Value for instrument set-up. See PDS 890.

Catalog Number	Description	MW	Excitation (nm)	Emission (nm)	Purpose
890	Certified Blank™	-	-	-	reference
897	Acridine Orange	265	500	526	DNA/RNA
886	Alexa Fluor® 488	643	499	519	conjugate
887	Alexa Fluor® 647	1300	652	668	conjugate
901	Allophycocyanine (APC)	104k	650	660	conjugate
914	APC-Cy™7	104k	650	767	conjugate
898	Chlorophyll (a + b)	8014 (a) 907 (b)	430,453	642,662	plant pigment
895	Cy™5	792	649	666	conjugate
906	DAPI	277	350	470	DNA (A-T)
913	Far-Out Red	-	475,590	663	reference
891	Fluorescein	389	495	519	conjugate
894	Hoechst 33342	616	346	375,390	dsDNA
916	Pacific Blue™	339	410	455	conjugate
899	PE (R-Phyoerythrin)	240k	480, 565	578	conjugate
908	PE-Cy™5	240k	480,565,650	670	conjugate
889	PE-Cy™7	240k	480	767	conjugate
909	PE-TR	240k	480,565,650	670	conjugate
892	Propidium Iodide	668	536	617	DNA intercalator
905	T.M. Rhodamine (TRITC, TAMRA)	430	557	576	conjugate
893	Texas Red® (Sulforhodamine)	625	589	615	conjugate
915	Violet Laser (Glacial Blue)	-	360	450	reference

Please see BangsLabs.com for pricing or contact a local agent.

ALIGNMENT

Microspheres with narrow fluorescence coefficients of variation (CVs) are used for alignment. Fixed alignment instruments are verified periodically, while tunable instruments are aligned on a daily basis. Some applications, such as DNA content analysis, will also dictate daily alignment verification.

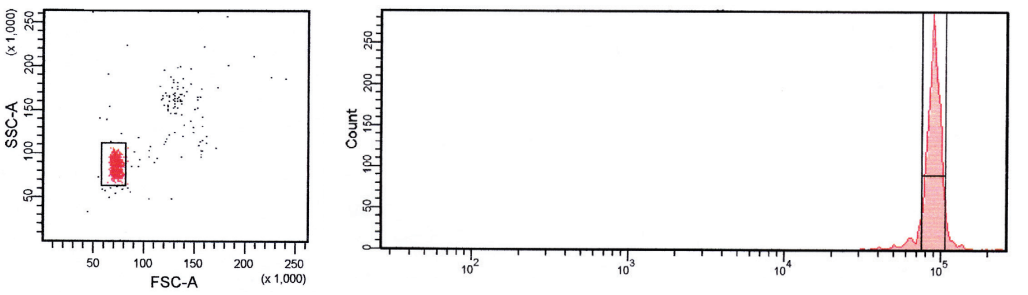
Although reference fluorescence CVs are provided on product Certificates of Analysis, it is important that instrument-specific tolerances be established. These should be developed on an optimally aligned instrument, i.e. immediately following a service visit. Keep in mind that fluorescence CV is dependent upon flow rate, concentration, and the optical system of the instrument.

Right Reference Standard™

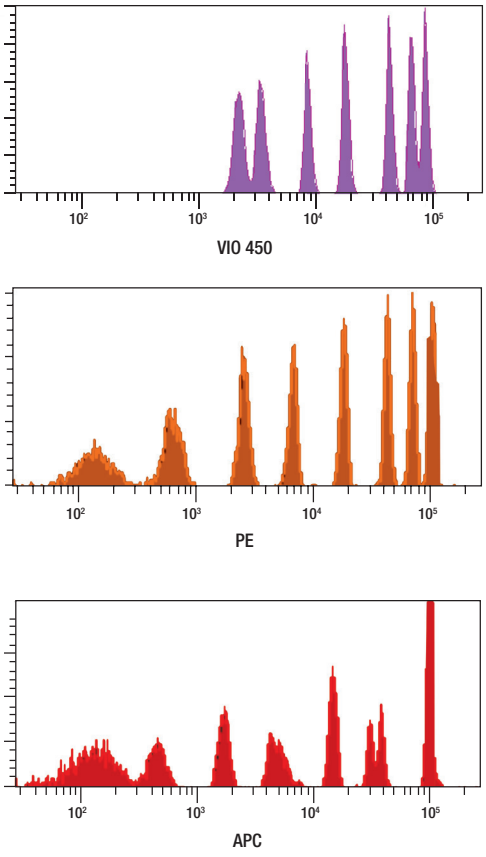
Each standard consists of a population of microspheres surface-labeled with a single fluorochrome at a high intensity level. With their narrow fluorescence CVs, Right Reference Standard products are suitable for alignment purposes. These standards may also be used to QC a specific path of the optical system (laser / filter / PMT), and to establish a unified fluorescence range for a particular detector. See PDS 510.

Catalog Number	Description	Unit size
512	Right Reference Standard Fluorescein High Level	100 tests
515	Right Reference Standard Phycoerythrin High Level	100 tests
518	Right Reference Standard PE-Cy™5 High Level	100 tests
521	Right Reference Standard APC High Level	100 tests

Please see BangsLabs.com for pricing or contact a local agent.



FLOW CYTOMETRY QUALITY CONTROL



Quantum™ QC histograms

LINEARITY

The accurate measurement of fluorescence signal is imperative for applications in quantitative fluorescence cytometry, such as surface marker expression or telomere length determination. To this end, the linear response of the PMTs must be assessed regularly.

Fluorochrome-labeled microspheres of differing intensities are used to generate a standard curve relating channel values to fluorescence intensity. Our QuickCal (linearity) analysis template (pg 84-85) calculates a regression and reports the regression coefficient (r^2), which should be as near as possible to 1.0. Deviations may indicate the need for maintenance or calibration of components of the instrument's optical system.

Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that is intended for use as an in-depth tool for daily cytometer QC, and is appropriate for use with all lasers and detectors. It may be used to determine detection thresholds, understand resolution, and assess and track linearity of detectors. It can aid in providing confidence that the system is suitable for use, or alert operators to potential problems before samples are run.

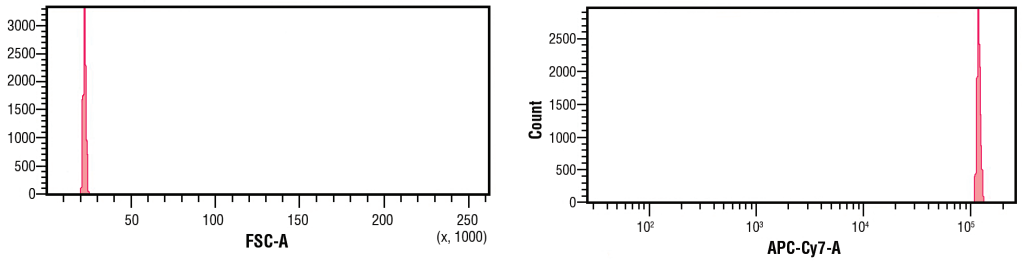
Quantum QC may also be used for instrument set-up to achieve standardized PMT settings and define the window of analysis for relevant detectors. See PDS 725 & 725A for all representative histograms.

Catalog Number	Description	Unit Size
725	Quantum QC, 8 Peak Beads	100 Tests

Please see BangsLabs.com for pricing or contact a local agent.

TIME DELAY

Flow cytometers generate a tremendous amount of data for each cell that is analyzed, and this is particularly true for instruments equipped with more than one laser. To be meaningful, the information that is collected by the detectors off of each laser must be integrated and attributed to the proper cell. Provided that time delays are in calibration, the instrument is able to "track" the cell as it passes by each laser for correct data assimilation and reporting.



The highly uniform Time Delay Calibration Standard exhibits red / far-red emission.

Time Delay Calibration Standard

Bangs' Time Delay Calibration Standard is intended for use in assessing the delay between blue and red lasers. It features ~6µm microspheres dyed with a fluorophore that is excited at 488nm and 635nm, and exhibits red / far-red emission. See PDS 831.

Catalog Number	Description	Unit Size
830	Time Delay Calibration Standard	A(20), B (100), C(280) Tests

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY QUALITY CONTROL

GENERAL INSTRUMENT SET-UP

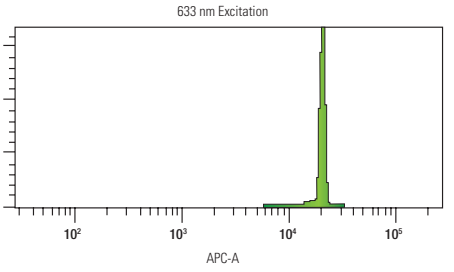
In flow cytometry, uniform instrument set-up and standardization are essential for achieving consistent results and generating comparable data. The program should be comprehensive, encompassing reagents, protocols, instrument configuration, and, for quantitative analyses, fluorescence intensity measurements.

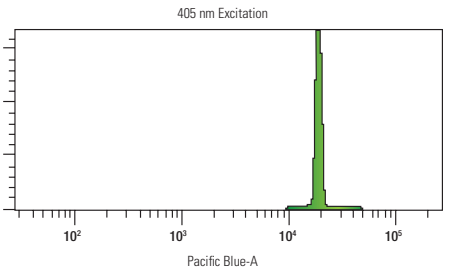
Flow cytometers are highly configurable, and results can vary considerably with different instrument settings. Establishing a common "Window of Analysis" for each detector, with upper and lower fluorescence limits defined, allows reference populations to be positioned in approximately the same place on the scale. This type of standardized instrument set-up ensures consistency of results from specific instruments and enables meaningful data comparison between instruments. Standardized instrument set-up using Full Spectrum or Quantum QC can ameliorate differences in range, relative scale, and reporting units, as well as daily fluctuation due to electronic noise and ambient temperature and humidity.

Instrument Standardization	PMT Voltages Compensation settings
Sample Protocols	Sample collection: Anticoagulant Sample storage conditions: Time & Temperature Sample preparation: Lysis, Fixation, Cooling / warming, & Staining
Reagents	Antibodies: Clone, Purity, Concentration & Labeling density, i.e. Fluorophore: Protein (F/P) ratio, Fixatives, Lysing agents & Anticoagulants
Fluorescence scale	Window of Analysis Fluorescence intensity units

Full Spectrum™

Full Spectrum™ microspheres are used to perform the initial daily QC check on 3-9+ color instruments. The microspheres are internally labeled with multiple fluorophores for use with common excitation and detection wavelengths within the visible spectrum. See PDS 885 for histograms for all detectors.

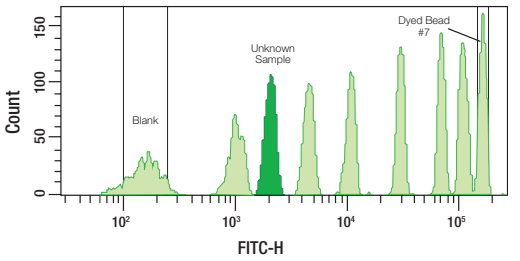




Catalog Number	Description	Unit Size
885	Full Spectrum™	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Quantum™ QC for window of analysis set-up.



Quantum™ QC, 8 Peak Beads

Quantum QC is a multi-intensity, multi-fluorescent standard that may be used to set up all detectors by postioning a specific peak at a target channel value. See PDS 725 & 725A for histograms for all detectors.

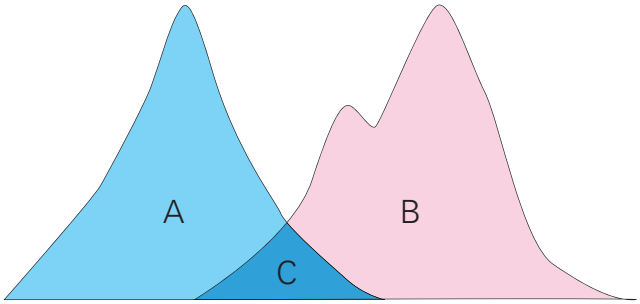
Catalog Number	Description	Unit Size
725	Quantum QC, 8 Peak Beads	100 Tests

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY INSTRUMENT SET-UP

COMPENSATION

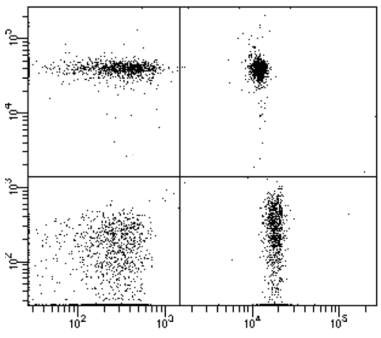
Microsphere standards offer a convenient means to establish compensation settings for multicolor analyses. Proper compensation requires reference materials that represent the actual fluorophore combinations of stained cells. Bangs offers microspheres pre-labeled with the same fluorophores that are used to stain cells in addition to microspheres featuring capture antibody or functional groups for labeling by the user.



Fluorescence Overlap / Carryover

FITC / PE Compensation Standard

The FITC / PE Compensation Standard includes four microsphere populations: an Autofluor™ population, and single populations surface labeled with FITC, PE, and FITC/PE. The Autofluor™ population is dyed with a low level of fluorophore to approximate the autofluorescence of an unstained resting lymphocyte. This kit is useful for establishing quadrant boundaries and compensation settings for analyses utilizing FITC and PE fluorochromes. See PDS 820.



Catalog Number	Description	Unit Size
820	FITC / PE Compensation Standard (Autofluor™ / FITC-PE / FITC / PE)	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular® Compensation Standard

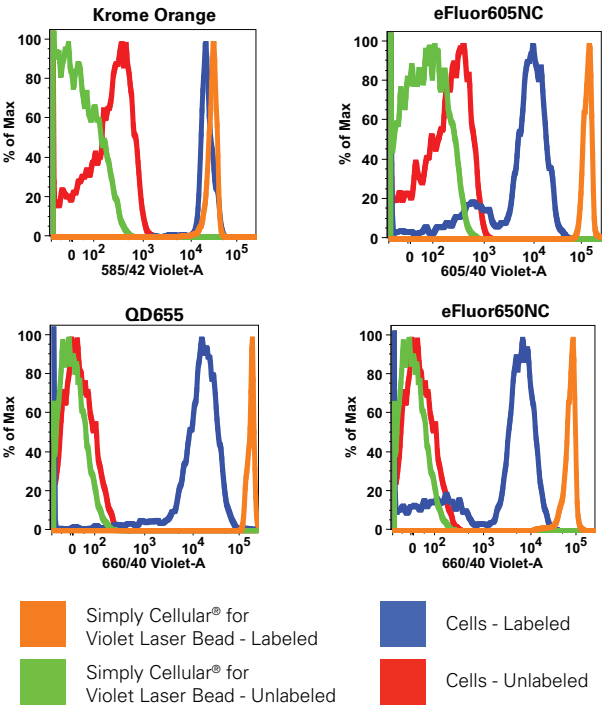
The Simply Cellular Compensation Standard includes a mixed population of low- and high-binding antibody-capture beads. Aliquots are labeled with antibody conjugates of interest to establish suitable compensation settings for specific analyses. Anti-Mouse IgG, anti-Rat IgG, and anti-human IgG versions are available. See PDS 850.

Catalog Number	Description	Unit Size
550	Simply Cellular Compensation Standard (anti-Mouse IgG)	(B) 100 Tests
556	Simply Cellular Compensation Standard - High (anti-Mouse IgG)	(B) 100 Tests
551	Simply Cellular Compensation Standard (anti-Rat IgG)	(B) 100 Tests
552	Simply Cellular Compensation Standard (anti-Human IgG)	(B) 100 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular® anti-Mouse for Violet Laser

The Simply Cellular anti-Mouse for Violet Laser standard features microsphere populations comprised of a proprietary matrix that exhibits low autofluorescence with violet excitation. It includes mouse IgG binding and one blank population. Beads may be labeled with mouse mAbs conjugated with violet fluorochromes, and for use as a compensation or general reference standard for detectors off of the violet laser. Beads are also suitable for use with other fluorochromes and lasers / detectors, e.g. 488nm, 633nm. See PDS 835.



Catalog Number	Description	Unit Size
835	Simply Cellular anti-Mouse IgG for Violet Laser	(A) 20 Tests or (B) 100 Tests

Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY INSTRUMENT SET-UP

Flow Cytometry Protein A or Protein G Antibody Binding Beads

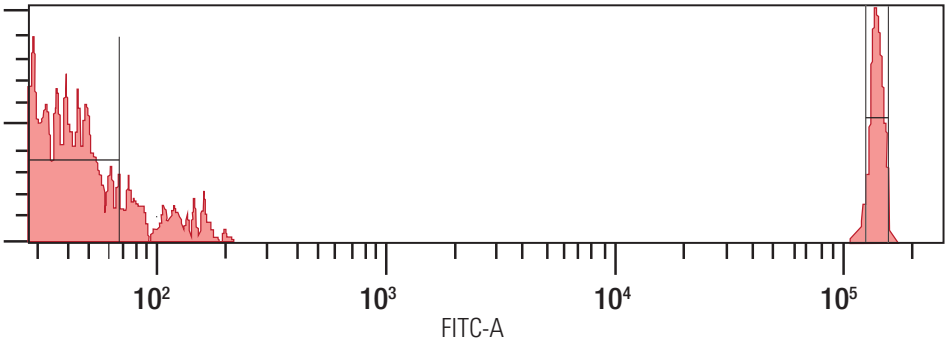
Single population Protein A or Protein G microspheres are suitable for labeling with conjugated antibodies from a range of hosts. Labeled microspheres may be used as single-population reference standards or in conjunction with an unlabeled population for compensation purposes. See page 31 or PDS 854 for a listing of affinities for IgG from specific hosts or of specific isotype.

Catalog Number	Description	Unit Size
553	Flow Cytometry Protein A Antibody Binding Beads	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
554	Flow Cytometry Protein G Antibody Binding Beads	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standard

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation standards for flow cytometric analyses. Beads are not suitable for labeling with DNA stains such as propidium iodide, DAPI, or SYTOX®, and users should contact us for discussion if uncertain as to the compatibility of a specific dye or stain. See PDS 853.

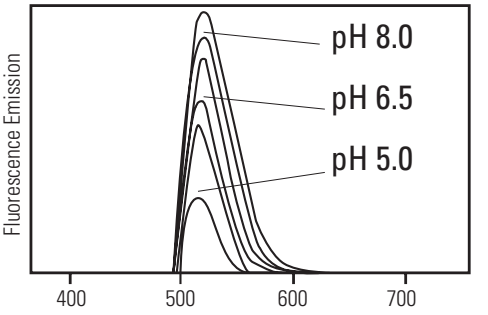


Catalog Number	Description	Unit Size
450	Viability Dye Compensation Standard, 4µm	3mL
451	Viability Dye Compensation Standard, 8µm	3mL

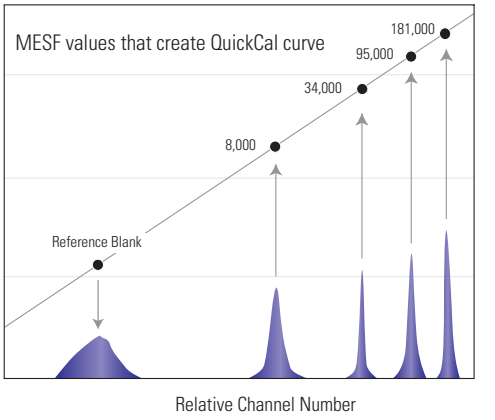
Please see BangsLabs.com for pricing or contact a local agent.

FLOW CYTOMETRY FLUORESCENCE QUANTITATION

Fluorescence cytometry is an important tool for investigations in cell and molecular biology. This technology is routinely used for immunophenotyping and an expansive array of research applications, such as the study of protein phosphorylation, the determination of telomere length, and receptor occupancy.



Although fluorescence cytometry has proven to be a very powerful and versatile technology, it is not without limitations. Notably, without a standardized measure of fluorescence intensity, results of analyses can be described only in relative terms, such as "negative / positive," "dim / intermediate / bright," or in arbitrary fluorescence intensity units (e.g. MFI). The interpretation of fluorescence intensity measurements can be further complicated by factors such as daily instrument variation, differences in hardware (laser power, filter sets), PMT settings, software, environmental factors such as buffer pH, and fluorochrome labeling density of antibodies (F/P ratio). Quantitative fluorescence analyses demand the highest level of standardization. However, cytometers lack internal calibrators for fluorescence intensity, and are limited to reporting results in relative terms.



Our Quantum™ MESF and Quantum™ Simply Cellular® microspheres are external standards that enable the standardization of fluorescence intensity units irrespective of instrument and software. Moreover, they are labeled with the actual fluorochromes used to label cells, for synchronous response to the environment (consider the pH-responsive fluorescence intensity of fluorescein, upper right). The beads are run on the same day and at the same settings as samples to establish a calibration curve relating instrument channel values and standardized fluorescence intensity units (QuickCal, page 84-85). Unknowns may then be read against the curve for determination of expression (i.e. quantitation of the signal from each cell population). See our website for more resources such as product data sheets and a curated collection of application references.

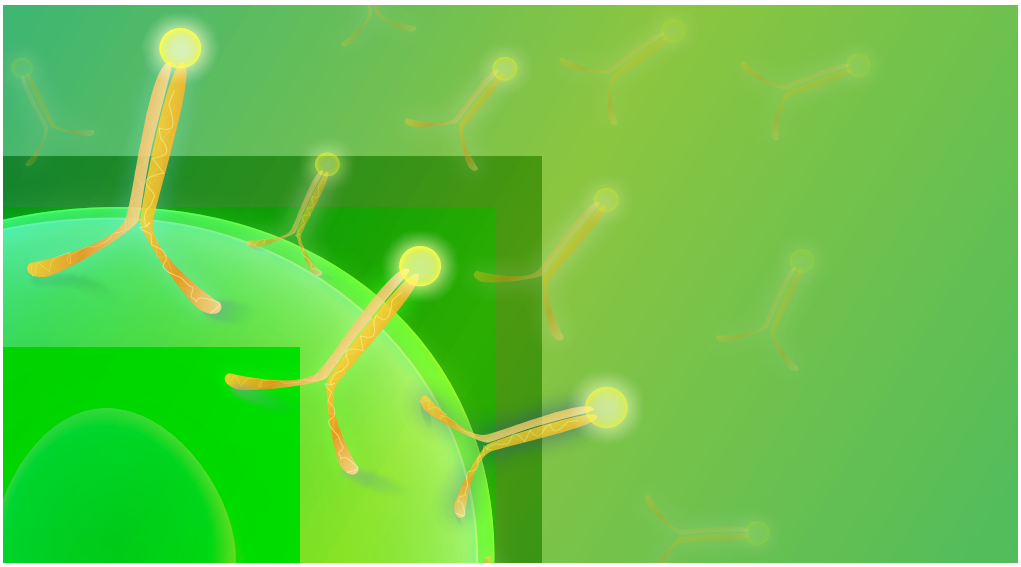
FLOW CYTOMETRY FLUORESCENCE QUANTITATION

Quantum™ MESF

Each Quantum MESF kit contains one blank population and a series of fluorescent microsphere populations labeled with varying amounts of Alexa Fluor® 488, R-PE, PE-Cy™5, Cy™5, Alexa Fluor® 647, or APC corresponding to standardized MESF units. Our MESF (Molecules of Equivalent Soluble Fluorochrome) provide a direct comparison of fluorescence measurements from solutions of the pure fluorochrome with those from microspheres surface-labeled with the same fluorochrome. A free QuickCal® analysis template (see pages 84-85) is provided with each kit to aid in determining expression levels of cells, and for evaluating instrument linearity and detection threshold. See PDS 821 and 818.

Catalog Number	Description	Unit Size
488	Quantum Alexa Fluor® 488 MESF	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
555	Quantum FITC-5 MESF	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
555p	Quantum FITC-5 MESF (Premix)	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
827	Quantum R-PE MESF	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
828	Quantum PE-Cy™5 MESF	(A) 20 Tests
822	Quantum Cy™5 MESF	(A) 20 Tests, (B) 100 Tests
647	Quantum Alexa Fluor® 647 MESF	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
823	Quantum APC MESF	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.



Quantum™ Simply Cellular®

Quantum Simply Cellular (QSC) kits are comprised of five microsphere populations: one blank and four labeled with increasing amounts of capture antibody. Each coated population binds a specific number of fluorophore-conjugated monoclonal antibodies of the noted host species, which is equivalent to its Antibody Binding Capacity (ABC) value. The beads are used to generate a calibration curve (QuickCal page 84-85), associating fluorescence intensity to the ABC values, or the number of bound antibodies. Our QuickCal software is used to determine the expression level of cells as well as instrument linearity and threshold. See PDS 814, 814A and 818.

Catalog Number	Description	Unit Size
815	Quantum Simply Cellular anti-Mouse IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
816	Quantum Simply Cellular anti-Human IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
817	Quantum Simply Cellular anti-Rat IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

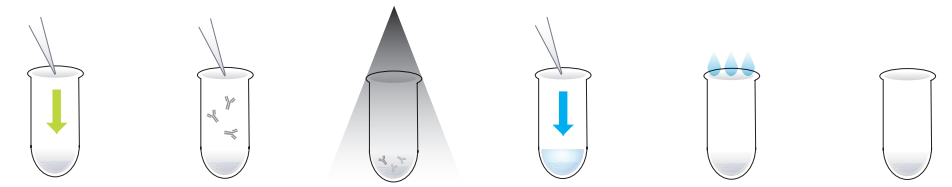
Please see BangsLabs.com for pricing or contact a local agent.

Simply Cellular®

Our Simply Cellular (SC) standard consists of a single population of antibody-coated microspheres of known Antibody Binding Capacity (ABC). The population is stained with the appropriate primary antibody and used in conjunction with a suitable Quantum MESF kit for determination of the antibody's effective Fluorophore / Protein (F/P) ratio. This standard may also be used to QC the fluorescence intensity of different antibody lots or clones. See PDS 814A and 849.

Catalog Number	Description	Unit Size
810	Simply Cellular anti-Mouse IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
812	Simply Cellular anti-Human IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
813	Simply Cellular anti-Rat IgG	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.



FLOW CYTOMETRY FLUORESCENCE QUANTITATION

QUICKCAL® ANALYSIS TEMPLATE

Bangs' Quantum™ systems for flow cytometry provide the means to standardize fluorescence intensity measurements, thereby permitting truly quantitative cellular expression analyses. Fluorochrome-labeled microspheres are used to generate a standard curve relating fluorescence intensity to standardized MESF or ABC values from Quantum™ MESF or Quantum™ Simply Cellular® kits. The MESF or ABC values of labeled cell samples may be determined by measuring their fluorescence intensities, and "reading" the corresponding MESF or ABC values from the standard curve using the QuickCal® analysis template that is provided with the kit.

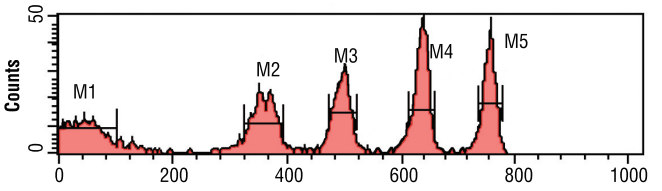
Bangs' Quantum™ kits are uniquely qualified for applications in quantitative fluorescence cytometry:

- Precise MESF or ABC values are assigned to bead populations through meticulous primary calibrations.
- MESF and ABC values provide standardized units of fluorescence intensity. The MESF unit has been formally adopted by NIST and NCCLS as a standardized measure of fluorescence intensity.
- Quantum™ microspheres are labeled with the actual fluorochromes used in flow cytometry, ensuring that quantitative assignments are truly relevant.
- Surface-labeled microspheres are environmentally-responsive; the fluorochrome on the bead responds to the buffer (pH, ionic strength) in the same manner as the fluorochrome on the labeled cell. The fluorescence intensity of beads thus mirrors that of cells, preserving the calibration when quantitative assignments are made.

QuickCal® Analysis Template Instructions

1. Run Quantum™ MESF or Quantum™ Simply Cellular® microspheres on the same day, same instrument, and at the same instrument settings (PMT and compensation) as labeled cell samples.
2. Gate on each peak within the fluorescence histogram.
3. Enter the median channel value of each fluorescence peak against its calibrated MESF or ABC value that appears within the QuickCal analysis template. A calibration curve will appear.
4. Enter median channel values of labeled samples for the automatic assignment of MESF or ABC values from the calibration curve.

See Also PDS 819 or QuickCal Video from BangsLabs.com.



Channel Value from Cytometer

Marker	% Gated	CV	Median
M1	21.73	117.64	11.00
M2	16.07	4.38	360.00
M3	15.67	2.21	496.00
M4	21.83	1.44	634.00
M5	16.98	1.10	752.00

Channel Value from Cytometer

Resulting MESF (or ABC) assignment of stained cell samples

Bangs Laboratories, Inc. QuickCal v 2.3

Quantum™ MESF Lot# xxxx

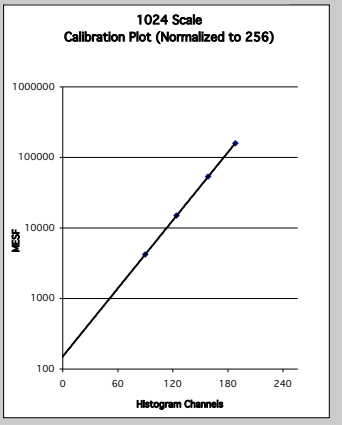
Acquisition Date dd/mm/yy
Entry Date dd/mm/yy

Bead	MESF	Channel
Blank		11
Bead #1	4211	360
Bead #2	15018	496
Bead #3	53558	634
Bead #4	158861	752

Comments:

Instrument
Make/Model:
PMT Setting:
Antibody Used:
Linear Regression: 1.0000
Detection Threshold: 167

#	Sample Name	Channel	MESF
1	Sample 1	555	25,739
2	Sample 2	603	40,139
3	Sample 3	568	29,031
4		Enter channel value	Data incomplete
5		Enter channel value	Data incomplete
6		Enter channel value	Data incomplete
7		Enter channel value	Data incomplete
8		Enter channel value	Data incomplete
9		Enter channel value	Data incomplete
10		Enter channel value	Data incomplete



QuickCal® v 2.3 Analysis Template

FLOW APPLICATIONS

CELL CYCLE ANALYSIS

Bangs Laboratories offers a range of microspheres that may be used as standards to support flow cytometric assays in cell proliferation and apoptosis. Beads may be used for routine instrument set-up and QC, or as test-specific standards.

Fluorescence Reference Standards

Products include beads that may be used as single-color fluorescent reference standards, or mixed at specific ratios to achieve different levels of surrogate viable, apoptotic, or dead populations. Several of the actual dyes that are commonly used in cell cycle analysis are represented within our line of Fluorescence Reference Standards, and we additionally offer many fluorescent beads that may be used as spectral surrogates for other stains and indicators. A full listing of Fluorescence Reference Standards can be found on page 72.

Catalog Number	Description	Unit Size
897	Acridine Orange	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
906	DAPI	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
891	Fluorescein	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
894	Hoechst 33342	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests
892	Propidium Iodide	(A) 20 Tests, (B) 100 Tests, (C) 280 Tests

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standard

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation or general reference standards for flow cytometric analyses. Beads are available in two diameters (both supplied at $1e^{+7}$ beads/mL) that approximate the sizes of common cell populations. See PDS 853.

Catalog Number	Description	Unit Size
450	Viability Dye Compensation Standard, 4µm	3mL
451	Viability Dye Compensation Standard, 8µm	3mL

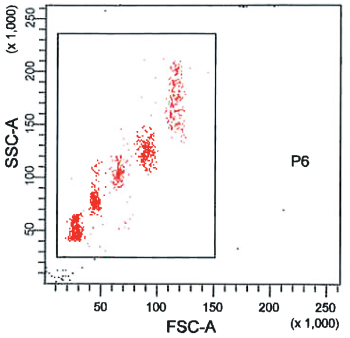
Please see BangsLabs.com for pricing or contact a local agent.

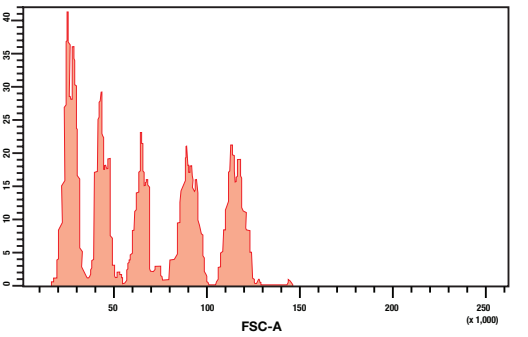
CELL SIZE ESTIMATION

Though flow cytometers are not particle sizers, *per se*, they are frequently used to estimate cell size. Our various size range kits, with particles spanning from 50nm - 11µm, can aid in exploring cytometer capabilities and in optimizing instrument configuration for the analysis of cellular and sub-cellular particles. See also our NIST Traceable Size Standards (page 92 - 93) for additional options.

Size Calibration Standards Kit

The Size Calibration Standards Kit is comprised of five populations of undyed microspheres in the range of ~4 – 11µm. Forward scatter channel (FSC) values may be plotted against reported bead diameter to generate a curve that may be used for estimation of the sizes of cells run at the same instrument settings. See PDS 829.





Catalog Number	Description	Unit Size
829	Size Calibration Standards Kit (~4 – 11µm)	(B) 100 Tests or (C) 280 Tests

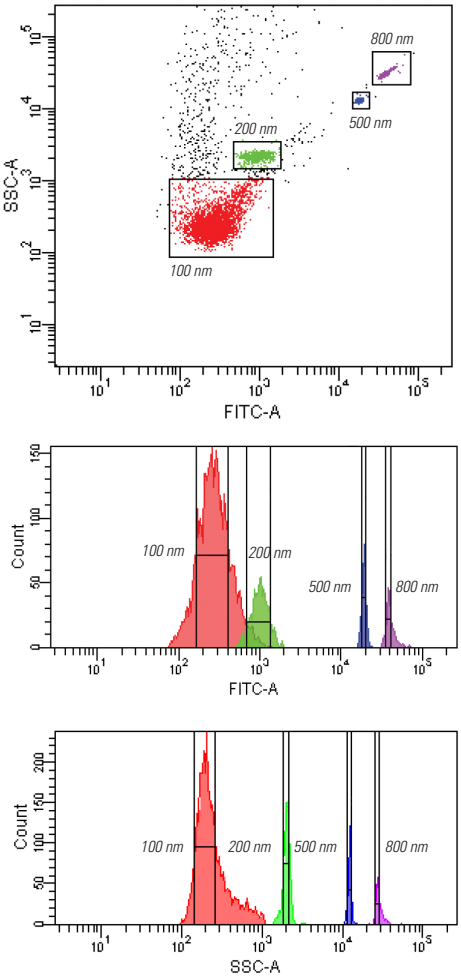
Please see BangsLabs.com for pricing or contact a local agent.

FLOW APPLICATIONS

SMALL PARTICLE ANALYSIS

Current applications in flow cytometry extend far beyond traditional lymphocyte immunophenotyping, with some involving the analysis of very small particles such as exosomes, microvesicles, or platelet- and endothelial-derived microparticles or microbial species. Our Small Bead Calibration Kits allow operators to verify the resolution capabilities of the flow cytometer, and to establish appropriate instrument settings for analyses of small particles such as exosomes and microparticles.

Nanobead kit & Submicron kit



Small Bead Calibration Kits

The dot plot and histograms (left) demonstrate results obtained on a standard BD™ LSRII. The resolution capabilities of instruments can differ, and results may vary depending upon the specific instrument model and any specialized components. Microspheres are internally dyed with our YG fluorophore, permitting gating via SSC / green fluorescence. Small particles present particular challenges in flow cytometry, and users may or may not be able to conduct FSC (size) - based gating. It may also be necessary to adjust thresholds and voltages to achieve separation of the populations. See PDS 832 and 834 for detailed tips and troubleshooting list for running submicron particles.

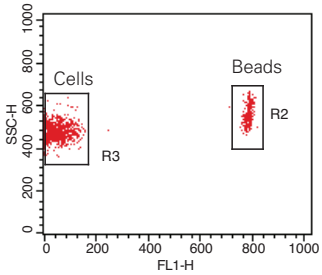
Catalog Number	Description	Unit Size
834	Nanobead Calibration Kit - 50nm, 100nm	3mL
832	Submicron Bead Calibration Kit - 0.2µm, 0.5µm, 0.8µm	3mL
833	Micron Bead Calibration Kit - 1.0µm, 3.0µm, 6.0µm	3mL

Please see BangsLabs.com for pricing or contact a local agent.

Though the application of particle counting technology is diverse, there is a common need for instrument validation and ongoing QC. Microsphere-based particle count standards may be used to validate liquid counters across their dynamic ranges and to ensure continued capability through the performance of daily QC checks. The use of a reference material permits the standardization of results between runs, instruments and laboratories, and over time. Our particle count standards include both general and instrument-focused (flow cytometer, cell viability analyzer) controls, and we can customize products to meet the needs of your program.

Flow Cytometry Absolute Count Standard™

Our Flow Cytometry Absolute Count Standard is a precisely-counted population of microspheres (~1e^{+6} beads/mL) for estimating the concentrations of unlabeled cells via flow cytometry. Beads are dyed with multiple fluorophores for excitation with common lasers (e.g. 488nm, 633nm) and discrimination from the cell population. By evaluating the ratio of microspheres to cells, the volumetric number of cells may be determined. See PDS 880.



Catalog Number	Description	Unit Size
580	Flow Cytometry Absolute Count Standard	10mL

Please see BangsLabs.com for pricing or contact a local agent.

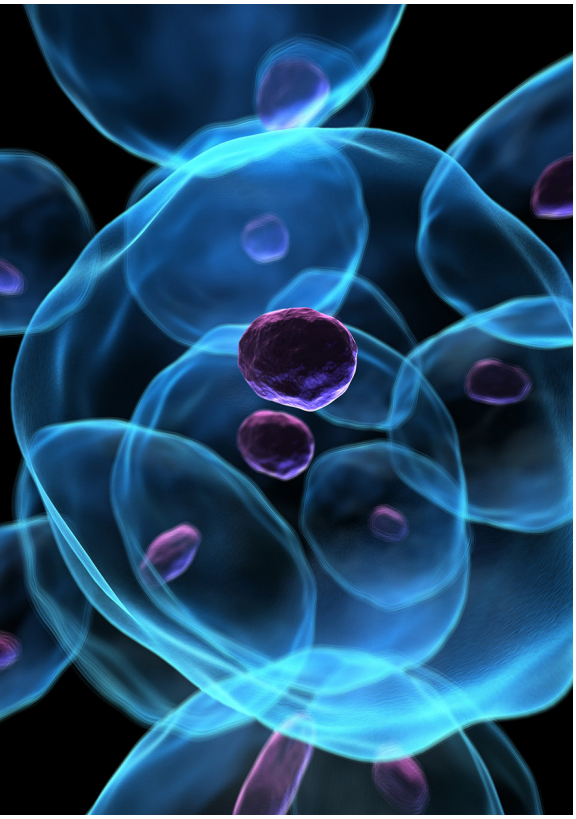
SureCount™ Particle Count Standards

SureCount beads are suspensions of polymer microspheres intended to aid in particle counting methods and their supporting sample preparation processes. They complement our other count and concentration controls, and may be used with flow cytometers or other counters when a dyed bead is not required. SureCount standards are available in four sizes (3µm, 5µm, 10µm, or 15µm), with diameters traceable to NIST Standard Reference Materials. The standards are supplied as ~1 x 10^{6} microspheres/mL aqueous suspensions. See PDS 733 and TSD 0706.

Catalog Number	Description	Unit Size
CC03N	SureCount Particle Count Standard, 3µm	10mL
CC05N	SureCount Particle Count Standard, 5µm	10mL
CC10N	SureCount Particle Count Standard, 10µm	10mL
CC15N	SureCount Particle Count Standard, 15µm	10mL

Please see BangsLabs.com for pricing or contact a local agent.

CELL VIABILITY & CONCENTRATION STANDARDS



ViaCheck™ Cell Viability and Concentration Controls

Viability and concentration determinations are integral to the cell culture technologies used in recombinant protein production and a wealth of research and diagnostic applications. Methods for determining cell viability and counts may rely on visible dye (trypan blue, page 51) exclusion and imaging using a hemocytometer or automated analyzer (e.g. Vi-CELL®), or cell labeling with membrane-impermeable fluorescent dyes (propidium iodide, DAPI, Hoechst, LIVE/DEAD) with flow cytometric analysis (see page 86).

Our ViaCheck Cell Viability and Concentration Controls complement our extensive line of microsphere standards for instrument QC. ViaCheck standards mimic the light scattering characteristics of live and dead cells in the trypan blue dye exclusion method, and may be used to confirm the capabilities and verify the performance of image-based cell viability instruments (e.g. Vi-CELL®). The standards are available in a range of common concentrations and live/dead ratios. See PDS 706, 711 and TSD 0706.

Catalog Number	Description	Unit Size
VC10B	ViaCheck 0% Viability Control	20mL
VC25B	ViaCheck 25% Viability Control	20mL
VC20B	ViaCheck 50% Viability Control	20mL
VC30B	ViaCheck 75% Viability Control	20mL
VC40B	ViaCheck 90% Viability Control	20mL
VC50B	ViaCheck 100% Viability Control	20mL
VC60N	ViaCheck Concentration Control (1×10^6)	20mL
VC70N	ViaCheck Concentration Control (4×10^6)	20mL
VC80N	ViaCheck Concentration Control (8×10^6)	20mL

Please see BangsLabs.com for pricing or contact a local agent.

ViaCheck™ SingleShots™

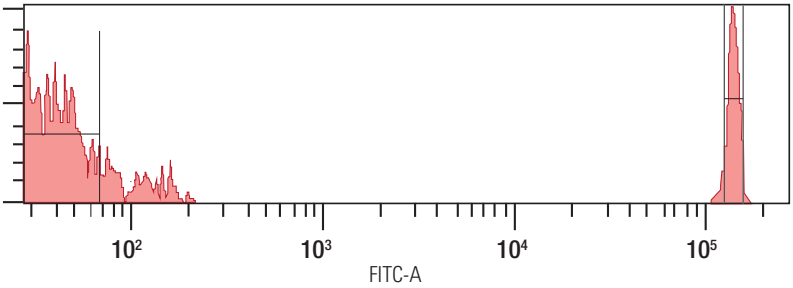
ViaCheck SingleShots provide trusted and affordable single-use QC. Mix, dispense & run for confirmation of live/dead ratios and counts. ViaCheck SingleShots minimize error and maximize efficiency by circumventing potential human error from repeated bottle resuspension & pipetting steps. See PDS 706, 711 and TSD 0706.

Catalog Number	Description	Units
VC10BSS	ViaCheck 0% Viability Control	25 or 75
VC25BSS	ViaCheck 25% Viability Control	25 or 75
VC20BSS	ViaCheck 50% Viability Control	25 or 75
VC30BSS	ViaCheck 75% Viability Control	25 or 75
VC40BSS	ViaCheck 90% Viability Control	25 or 75
VC50BSS	ViaCheck 100% Viability Control	25 or 75
VC60NSS	ViaCheck Concentration Control (1 x 10^6)	25 or 75
VC70NSS	ViaCheck Concentration Control (4 x 10^6)	25 or 75
VC80NSS	ViaCheck Concentration Control (8 x 10^6)	25 or 75

Please see BangsLabs.com for pricing or contact a local agent.

Viability Dye Compensation Standards

Viability Dye Compensation Standards are suitable for labeling with LIVE/DEAD® stains or other amine-reactive dyes to generate compensation or general reference standards for flow cytometric analyses. See PDS 853.



Catalog Number	Description	Unit Size
450	Viability Dye Compensation Standard, 4µm	3mL
451	Viability Dye Compensation Standard, 8µm	3mL

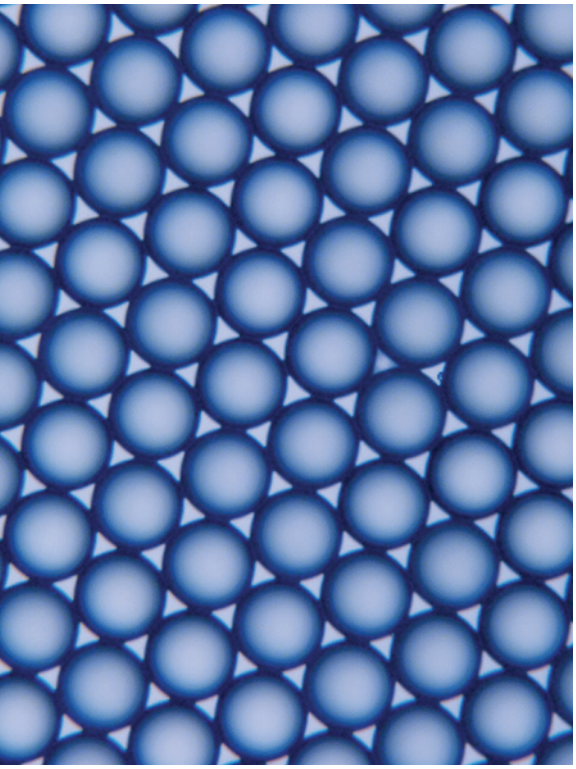
Please see BangsLabs.com for pricing or contact a local agent.

SIZE STANDARDS

Size standards may be used to validate particle sizers across their dynamic ranges. They are suitable for use in the performance of routine instrument calibration checks and corrections, and in the support of practice standards, such as those published by ISO, ASTM International, CEN, and others. Additionally, the use of a reference material permits the standardization of results between runs, instruments, laboratories, and over time.

Composition	Polystyrene
Refractive Index (589nm)	1.59*
Density (g/cm³)	1.05*

* Reported value for bulk polymer.



NIST Traceable Particle Size Standards

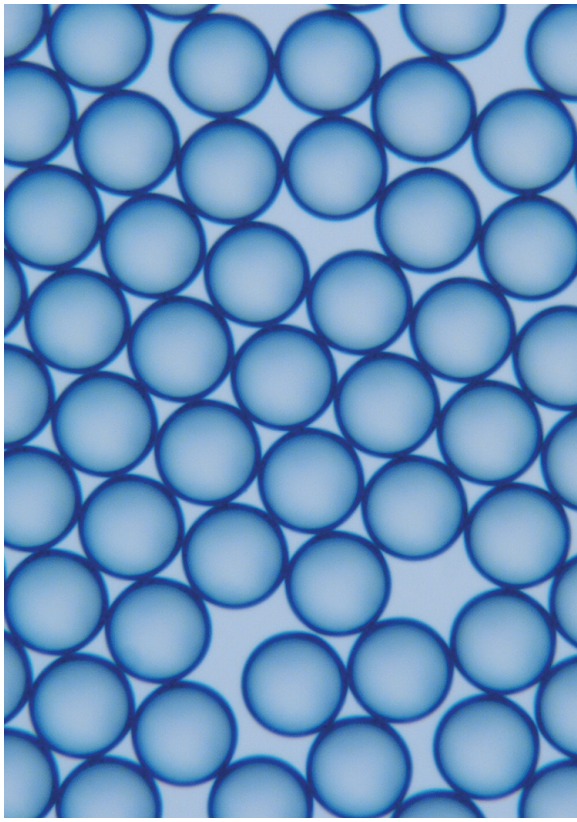
Our NIST Traceable Particle Size Standards are monodisperse polystyrene spheres available in diameters ranging from 40nm – 175µm. Suspensions are conveniently packaged in dropper bottles at 1% solids, and each bottle is provided with a Certificate of Traceability. See TN 105, Microsphere Size Standards and PDS 734.

Catalog Number	Nominal Diameter	Unit Size
NT02N	0.04µm	15mL
NT03N	0.06µm	15mL
NT04N	0.08µm	15mL
NT05N	0.10µm	15mL
NT06N	0.15µm	15mL
NT07N	0.20µm	15mL
NT08N	0.30µm	15mL
NT09N	0.40µm	15mL
NT10N	0.50µm	15mL
NT11N	0.60µm	15mL
NT12N	0.70µm	15mL
NT13N	0.80µm	15mL
NT14N	0.90µm	15mL
NT15N	1.00µm	15mL
NT16N	1.50µm	15mL
NT17N	2.00µm	15mL
NT18N	2.50µm	15mL
NT19N	3.00µm	15mL
NT20N	3.50µm	15mL

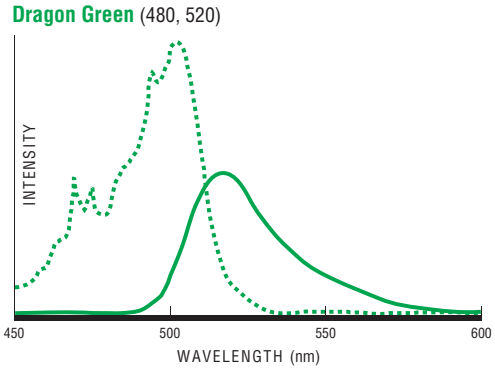
Please see BangsLabs.com for pricing or contact a local agent.

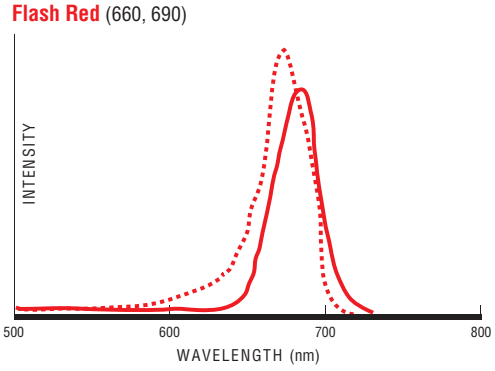
Catalog Number	Nominal Diameter	Unit Size
NT21N	4.00µm	15mL
NT22N	5.00µm	15mL
NT23N	6.00µm	15mL
NT24N	7.00µm	15mL
NT25N	8.00µm	15mL
NT26N	9.00µm	15mL
NT27N	10.00µm	15mL
NT28N	12.00µm	15mL
NT29N	15.00µm	15mL
NT30N	20.00µm	15mL
NT31N	25.00µm	15mL
NT32N	30.00µm	15mL
NT33N	40.00µm	15mL
NT34N	50.00µm	15mL
NT35N	60.00µm	15mL
NT36N	80.00µm	15mL
NT37N	100.00µm	15mL
NT38N	125.00µm	15mL
NT39N	150.00µm	15mL
NT40N	175.00µm	15mL

Please see BangsLabs.com for pricing or contact a local agent.



FLUORESCENCE IMAGING STANDARDS





Fluorescence Intensity Standard Kits

Fluorescence intensity standards have many applications both in instrument QC programs and in biological analyses.

We offer two intensity standard sets for these applications. Both the Dragon Green and Flash Red kits consist of five suspensions of ~8µm polystyrene-based microspheres dyed with increasing amounts of their respective fluorophore. Dragon Green is an excellent spectral surrogate for fluorescein and is suitable for use with fluorescein filter sets. As Flash Red is spectrally similar to Cy™5, traditional red fluorophore filter sets (e.g. Cy™5 for the microscope; PE-Cy™5 or APC on the cytometer) may be used with this standard.

The different intensity populations may serve as relative intensity standards for applications in fluorescence microscopy, where, as internally-dyed beads, they will stand up to the rigors of imaging. The beads may also serve as bright relative intensity or linearity standards for flow cytometry; ask about our QuickCal® Linearity Template if this is your interest. See PDS 704.

Catalog Number	Description	Unit Size
DG06M	Dragon Green Intensity Standard (5 intensities)	1mL × 5 populations
FR06M	Flash Red Intensity Standard (5 intensities)	1mL × 5 populations

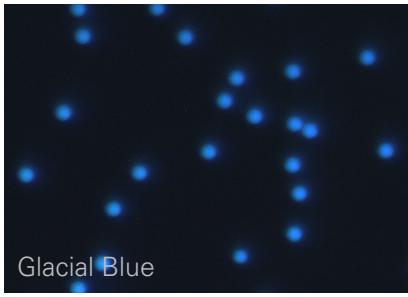
Please see BangsLabs.com for pricing or contact a local agent.

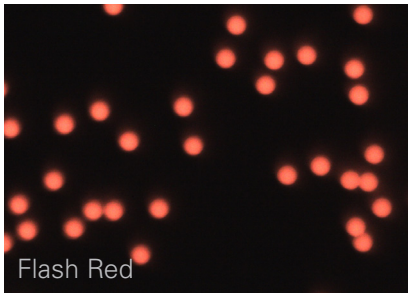
StarLight™ Calibration Slides

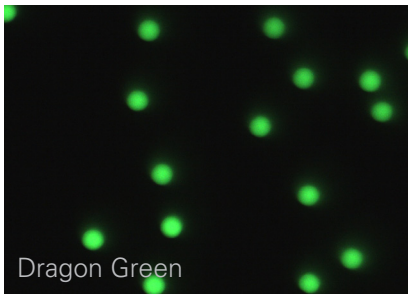
StarLight Calibration Slides are mounted with vibrant ~6µm fluorescent microspheres dyed with a single fluorophore for basic imaging checks and calibration for fluorescence microscopes. Our four standard versions are appropriate for use with common microscope filter sets: Glacial Blue (360, 450), Dragon Green (480, 520), Envy Green (525, 565), and Flash Red (660, 690). The calibration slides are available individually or as the full 4-slide collection. See our general use fluorescent microspheres on pages 20 - 25.

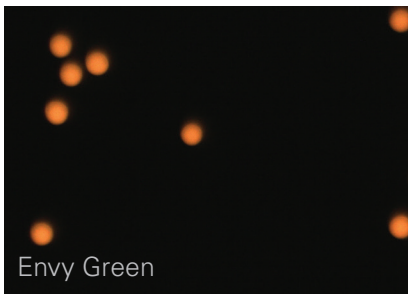
Catalog Number	Description
SL1GB	StarLight Calibration Slide – Glacial Blue (1 slide)
SL1DG	StarLight Calibration Slide – Dragon Green (1 slide)
SL1EG	StarLight Calibration Slide – Envy Green (1 slide)
SL1FR	StarLight Calibration Slide – Flash Red (1 slide)
SL04K	StarLight Collection – Slide 4-Pack (1 slide of each color)

Please see BangsLabs.com for pricing or contact a local agent.









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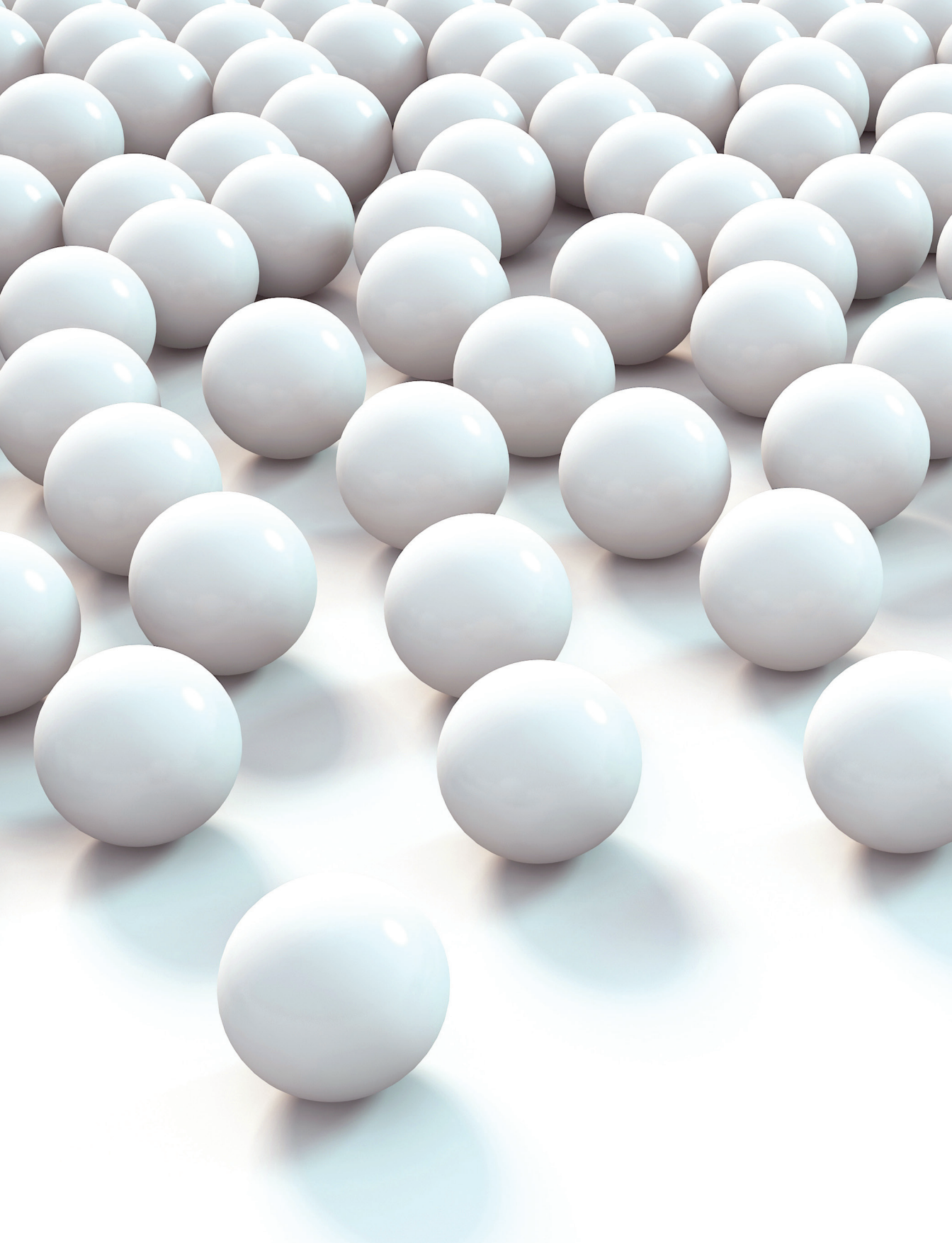

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