

ASSAY DEVELOPMENT

for Polymer, Magnetic & Fluorescent Microsphere Formats



WHO WE ARE...

Bangs Laboratories' more than 30 years of experience in microsphere synthesis and fine particle analysis have established us as a leading manufacturer of polymer, silica, and magnetic microspheres for laboratory instrument manufacturers and diagnostic assay developers. We understand what it takes to get IVD assays and platforms to market, and we have the products and the know-how to support you throughout the development and commercialization process. We manufacture at scales that will carry you from R&D through product launch and beyond, and under an ISO 13485:2016 Quality System that will meet your regulatory needs. Our proven synthesis and analytical methods ensure consistent manufacturing so that you receive microspheres made to specification time after time. If you require a product that is highly specialized, we are up to the challenge—our dyeing, coating and surface modification expertise is demonstrated in our specialty products for bioseparations and instrument standardization. We are also pleased to offer custom formulations, concentrations, and packaging to support OEM and private label needs. Contact us today, and let us put our decades of real-world experience to work for you!



TURBIDIMETRIC ASSAYS

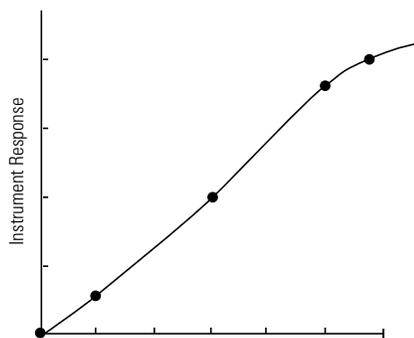
The assay of clinically-relevant biomarkers is important for treating critical medical conditions such as cardiovascular disease, thrombosis, bacterial infections, and active inflammatory conditions. Point-of-care (POC) turbidimetric assays are an important diagnostic tool for critical medicine, as they permit the rapid and sensitive measurement of disease-related biomarkers that may speak to the patient's condition, prognosis and treatment regimen.

Turbidimetric assays rely on the analyte-mediated agglutination of a suspension of ligand-coated particles. Changes in the light scattering properties of the suspension are monitored as the particles agglutinate, e.g. as they form doublets, triplets, etc. Assays may be designed such that very small, poorly-scattering spheres begin to scatter light more efficiently upon agglutination, or larger, more efficiently-scattering particles fall out of suspension with agglutination.

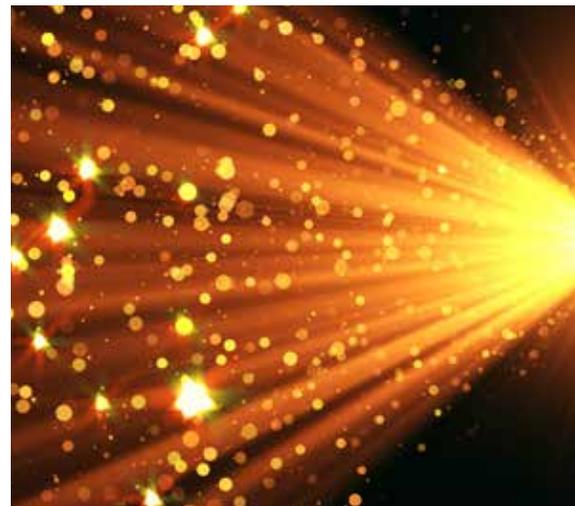
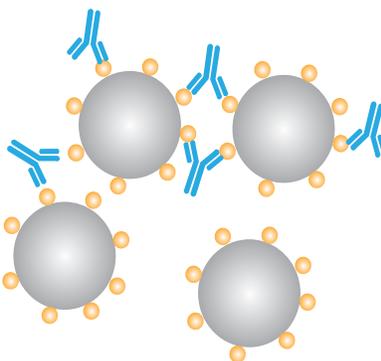
For initial screening, our active inventory includes many carboxyl-modified latex (CML) particles in the range of 0.05µm - 0.4µm, with different formulations, surfactant concentrations and carboxyl (COOH) content. We additionally offer custom services and bulk manufacturing to meet highly specific needs

References

1. Borque L, Bellod L, Rus A, Seco MS, Galisteo-González F. (2000) *Development and validation of an automated and ultrasensitive immunoturbidimetric assay for C-reactive protein*. Clin Chem; 46(11):1839-42.
2. Eda S, Kaufmann J, Roos W, Pohl S. (1998) *Development of a new microparticle-enhanced turbidimetric assay for C-reactive protein with superior features in analytical sensitivity and dynamic range*. J Clin Lab Anal; 12:137-144.
3. Molina-Bolívar JA, Galisteo-González F, & Hidalgo-Álvarez R. (1998). *Particle enhanced immunoassays stabilized by hydration forces: a comparative study between IgG and F(ab')₂ immunoreactivity*. J Immunol Methods, 211(1-2), 87-95.
4. Newman DJ, Thakkar H, Edwards RG, Wilkie M, White T, Grubb AO, Price CP. (1995) *Serum cystatin C measured by automated immunoassay: a more sensitive marker of changes in GFR than serum creatinine*. Kidney Intl; 47:312-318.
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6. Yuan X, Yoshimoto K, Nagasaki Y. (2009) *High-performance immunol latex possessing a mixed-PEG antibody coimmobilized surface: highly sensitive ferritin immunodiagnosics*. Anal Chem; 81:1549-1556.



Ab/Ag-mediated agglutination in a turbidimetric assay.



CARBOXYLATED POLYSTYRENE

Catalog Number	Nominal Diameter	Specification Range
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

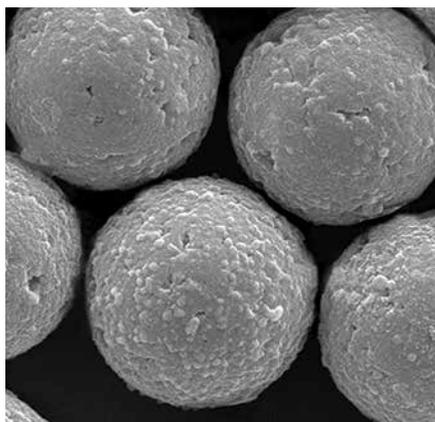
Our offerings include options for different levels of carboxylation.

Surface titer	Parking Area (Å ² /COOH group)
Low	60-100
Medium	35-59
High	10-34

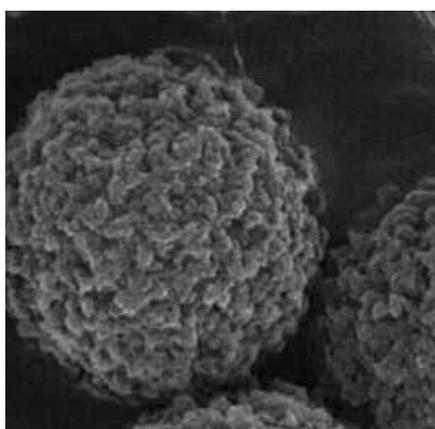
PLAIN POLYSTYRENE

Catalog Number	Nominal Diameter	Specification Range
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 - 0.185µm
PS02008	0.200µm	0.190 - 0.210µm
PS02009	0.300µm	0.270 - 0.330µm
PS02010	0.400µm	0.370 - 0.430µm

MAGNETIC PARTICLE ASSAYS



ProMag® HP



ProMag®

Bangs Laboratories' comprehensive range of superparamagnetic microparticles allows us to uniquely address a wide range of applications in the life sciences, including immunoassays, molecular assays and nucleic acid and other cellular & biomolecular isolations.

Chemiluminescence Assays

The high sensitivities, broad dynamic ranges, simple instrumentation and rapid results that characterize chemiluminescence assays make them well-suited to quantitative measurement of low analyte concentration in immuno- and molecular diagnostic applications. Whether developing assays for fully automated or laboratory-built analyzers, there are many design elements to consider, including assay format, sensitivity, emitter / luminescence system, and solid phase.

Both chemiluminescence (CL) and electrochemiluminescence (ECL) assays have featured a variety of magnetic particles as the solid phase to effectively capture target, enhance sensitivity, and support automation. Bangs' comprehensive line of magnetic particles allows us to address the unique requirements of a multitude of assay systems, with options for particle diameter, surface functionality, morphology, magnetic separation profile, and other characteristics. To facilitate particle selection and optimization, we have assembled Magnetic Sampler Packs featuring our most popular carboxyl (COOH) and streptavidin (SA) particles, including our latest addition, Magnefy™. See datasheets for additional product details.

References

1. Acharya D, Bastola P, Le L, Paul AM, Fernandez E, Diamond MS, Miao W, Bai F. (2016) *An ultrasensitive electrogenerated chemiluminescence-based immunoassay for specific detection of Zika virus*. *Sci Rep*; 6:32227.
2. Dodeigne C, Thunus L, Lejeune R. (2000) *Chemiluminescence as diagnostic tool. A review*. *Talanta*; 51:415-439.
3. Fu Z, Yan F, Liu H, Lin J, Ju H. (2008) *A channel-resolved approach coupled with magnet-captured technique for multianalyte chemiluminescent immunoassay*. *Biosens Bioelectron*; 23:1422-1428.
4. Fujita K, Kinukawa H, Ohno K, Ito Y, Saegusa H, Yoshimura T. (2015) *Development and evaluation of analytical performance of a fully automated chemiluminescent immunoassay for protein induced by vitamin K absence or antagonist II*. *Clin Biochem*; 48:1330-1336.
5. Mahler M, Bentow C, Serra J, Fritzler MJ. (2016) *Detection of autoantibodies using chemiluminescence technologies*. *Immunopharmacol Immunotoxicol*; 38(1):14-20.
6. Zhang H, Yu D, Zhao Y, Fan A. (2014) *Turn-on chemiluminescent sensing platform for label-free protease detection using streptavidin-modified magnetic beads*. *Biosens Bioelectron*; 61:45-50.

MAGNETIC PARTICLES FOR ASSAYS

Catalog Number	Product Description	Nominal Diameter	Morphology	Composition	Functionality	Datasheet
MFY0002, MFYS1N	Magnefy™	1.0µm	spheroid	polymer magnetic, encapsulated	COOH & SA	PDS 756
BP618, BP628	BioMag® Plus	1.5µm	irregular cluster	silanized iron oxide	COOH & SA	PDS 618, 621
PMC1N, PMS1N	ProMag® 1 series	1.0µm	spherical	polymer magnetic	COOH & SA	PDS 715
PMC3N, PMS3N	ProMag® 3 series	3.0µm	spherical	polymer magnetic	COOH & SA	PDS 715
PMC3HP, PMS3HP	ProMag® HP	3.0µm	spherical	polymer magnetic, encapsulated	COOH & SA	PDS 743
21940	Magnetic Streptavidin Sampler Pack	MFYS1N, Magnefy™ 1 SA - 1mL (1% solids) 10mg/mL PMS1N, ProMag 1 Series SA - 1mL (1% solids) 10mg/mL PMS3HP, ProMag HP 3µm SA - 1mL (1% solids) 10mg/mL BP628, BioMagPlus SA - 2mL (0.5% solids) 5mg / mL			SA	PDS 749
21950	Magnetic COOH Sampler Pack	MFY0002, Magnefy - 5mL (5% solids) 50mg/mL PMC1N, ProMag Series 1 - 5mL (2.5% solids) 25mg/mL PMC3HP, ProMag HP 3µm - 5mL (2.5% solids) 25mg/mL BP618, BioMagPlus - 5mL (2% solids) 20mg / mL			COOH	PDS 749

Molecular Assays & Nucleic Acid Isolations

Like immunoassays, molecular diagnostics rely on a wide range of assay formats, including colorimetric lateral flow, chemiluminescence, suspension array, time-resolved fluorescence, and other technologies. The magnetic particle table below provides general particle characteristics for consideration, and our Magnetic Sampler Packs feature a selection of particles that will allow you to conduct side-by-side comparisons in the lab. We are also adept at helping investigators navigate the particle landscape to select candidates for screening based on the specific context (test / assay format, instrument parameters and other design criteria), and invite you to contact us with your questions regarding particle use in your diagnostic application.

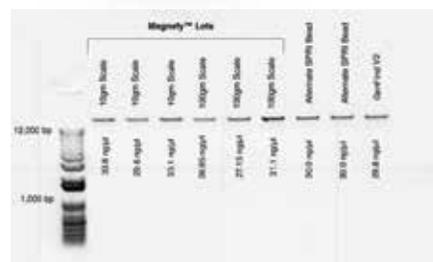
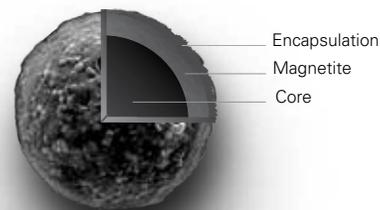
Magnetic particles are also used extensively in nucleic acid isolations, and we are proud to present our latest magnetic particle offering—Magnefy™. Magnefy offer an additional performance-driven solid phase for magnetic particle-based assays and isolations, including SPRI-based* total DNA isolation. (*Solid phase reversible immobilization, which features the isolation of high-purity nucleic acid in the presence of NaCl and PEG.) See datasheet 756 for additional product details.

No other company offers such a complete collection of magnetic particles for your screening and development efforts. See the magnetic particle matrix below for further assistance in choosing a magnetic particle for your specific application.

References

1. Fisher S, Barry A, Abreu J, Minie B, Nolan J, Delorey T M, *et al.* (2011). *A scalable, fully automated process for construction of sequence-ready human exome targeted capture libraries.* Genome Biol; 12(1), R1.
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3. Elkin CJ, Richardson PM, Fourcade HM, Hammon NM, Pollard MJ, Predki PF, *et al.* (2001). *High-throughput plasmid purification for capillary sequencing.* Genome Res; 11(7), 1269-1274.
4. Hawkins TL, O'Connor-Morin T, Roy A, Santillan C. (1994). *DNA purification and isolation using a solid-phase.* Nucleic Acids Res; 22(21), 4543-4.

MAGNEFY™	
Catalog Number	Product Description
MFY0002	1µm Magnefy™ • COOH
MFYS1N	1µm Magnefy™ • SA

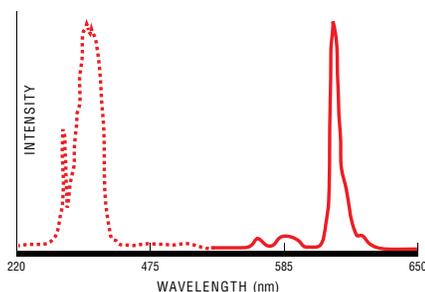


SPRI-based DNA isolation using Magnefy COOH

	ProMag® HP COOH	ProMag® HP SA	ProMag® COOH	ProMag® SA	ProMag® Protein G	Magnefy™ COOH	Magnefy™ SA	BioMag® COOH	BioMag® SA	BioMag® Protein A or Protein G	BioMag® WGA or ConA	BioMag® anti-CD marker	BioMag® (primary antibody)	BioMag® secondary antibody	BioMag® Oligo dT(20)	COMPEL™ COOH	COMPEL™ SA
Assays	Chemiluminescence	●	●	●	●	●	●	●	●								
	Immuno	●	●	●	●	●	●	●	●							●	●
	Molecular	●	●	●	●	●	●									●	●
	Flow cytometric															●	●
Isolations	Antibodies				●					●							
	Proteins	●	●	●	●			●	●							●	●
	Glycans, glycoproteins										●						
	Cells			●	●							●		●			
	Subcellular organelles							●		●	●		●				
	Immunoprecipitates			●		●		●		●			●				
	mRNA														●		
	DNA (total-SPRI)						●		●								
	DNA (specific sequence)	●	●	●	●	●		●	●								●
	Biopanning			●	●				●	●						●	●

FLUORESCENCE LATERAL FLOW (TRF)

Europium chelate (365, 610)



Lateral flow and other rapid tests fulfill important roles in the diagnostic landscape. Affordable and easy to use, they are particularly important for delivering diagnostic capability to programs with critical need, limited resources, or remote / de-centralized laboratories. While many significant tests have been developed using conventional particles (e.g. colloidal gold), the use of europium chelate (Eu(III)) nanoparticles has made it possible to develop rapid immunoassays that offer far greater sensitivity and quantitative results.

The europium chelate complex possesses a longer fluorescence lifetime (μs) than traditional fluorophores (ns), allowing signal to be collected beyond the lifetime of background fluorescence. Moreover, its long Stokes shift ensures that incident light from the excitation source ($\lambda \sim 330\text{-}340\text{nm}$) does not interfere with collection of reporter signal by the detector ($\lambda \sim 610\text{-}620\text{nm}$). These traits, coupled with the availability of small, portable time-resolved fluorescence (TRF) readers, present new opportunities in the evolution of rapid diagnostics.

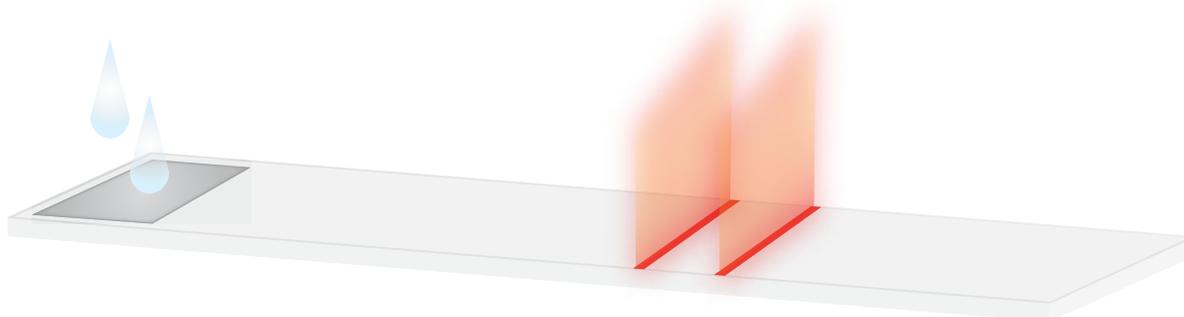
Our highly-fluorescent europium (III) nanoparticles offer exceptional functionality and stability for the development of diagnostic reagents. They have been utilized to develop highly sensitive assays in lateral flow and microplate formats, and are compatible with commercial europium chelate TRF readers. They are supplied in aqueous suspension at 1% solids (10mg/mL). See datasheet 741 for additional product details.

EUROPIUM CHELATE

Catalog Number	Description	Nominal Diameter
FCEU001	PS-COOH Europium Chelate	0.10 μm
FCEU002	PS-COOH Europium Chelate	0.20 μm
FCEU003	PS-COOH Europium Chelate	0.30 μm
21960	Europium Chelate COOH Sampler Pack	0.1 μm , 0.2 μm , & 0.3 μm x 1mL

References

1. Bao DT, Kim DTH, Park H, Cuc BT, Ngok NM, Linh NTP, *et al.* (2017) *Rapid detection of avian influenza virus by fluorescent diagnostic assay using an epitope-derived peptide*. *Theranostics*; 7(7):1835-1846.
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3. Soukka T, Paukkunen J, Härmä H, Lönnberg S, Lindroos H, & Lövgren T. (2001). *Supersensitive time-resolved immunofluorometric assay of free prostate-specific antigen with nanoparticle label technology*. *Clin Chem*; 47(7), 1269-1278.
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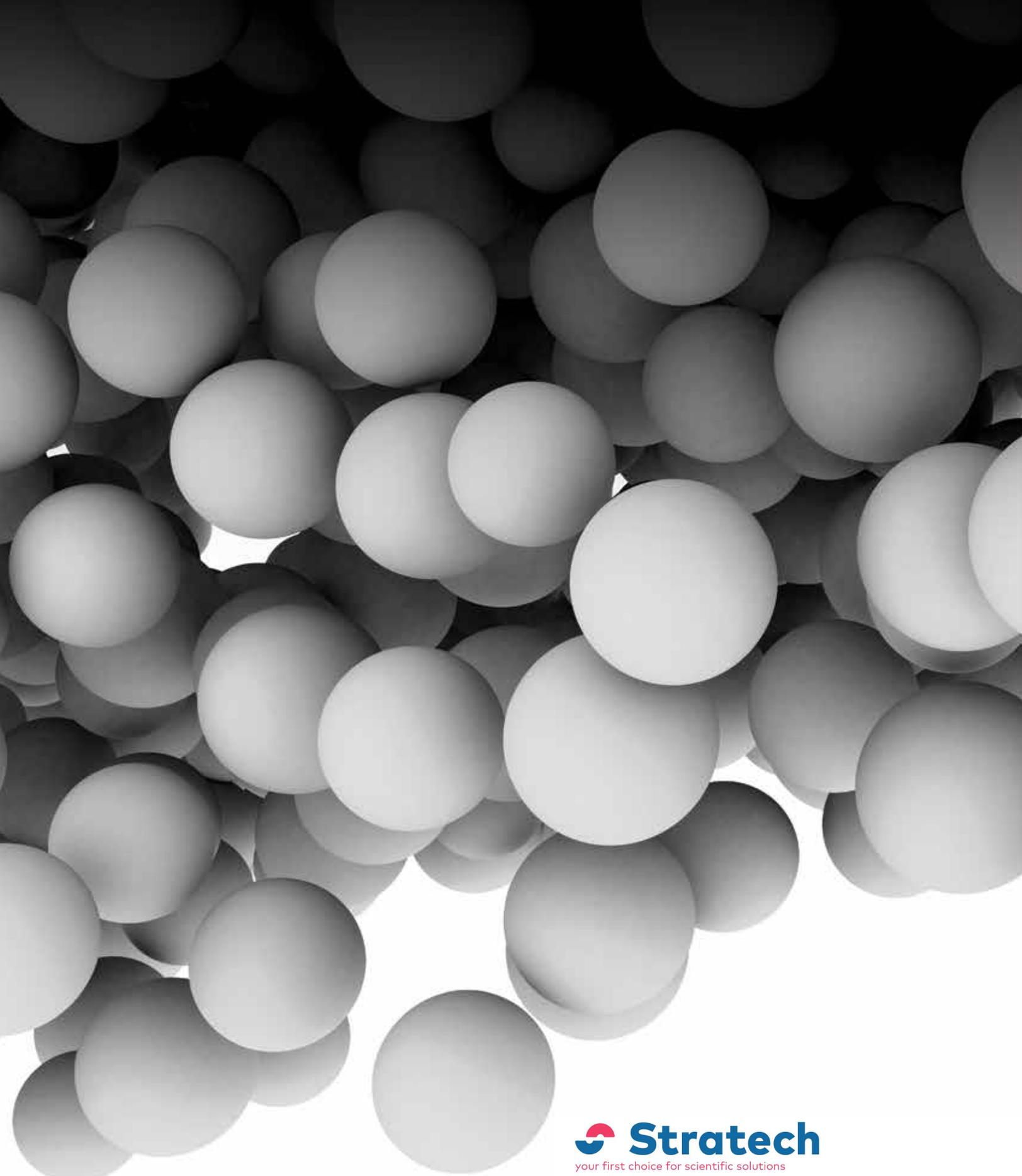
AND THAT'S NOT ALL..

Bangs manufactures polymeric, silica, and superparamagnetic particles that are additionally offered with a variety of surface functional groups, visibly colored or fluorescent dyes, and affinity ligand coatings to meet the diverse needs of the IVD diagnostics market. 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.

Our catalog also contains many types of particle standards and calibrators for laboratory instruments, including size, count, cell viability, and slide-based products. Our Flow Cytometry products provide standardization and calibration tools that lead the industry in quantitative fluorescence detection.

If a product that you require is not listed here, please check our website www.bangslabs.com as our offerings are continually expanding. For special requirements, please contact us regarding our custom bulk synthesis and OEM contract manufacturing services. We also provide many technical resources on our website such as curated references, TechNotes, infographics, & videos. We are here for you, let us know how we can help.





Bangs Laboratories, Inc.

BEADS ABOVE THE REST

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