

Sera-Mag™ Streptavidin, SpeedBeads Streptavidin and Sera-Mag™ SpeedBeads NeutrAvidin™-Coated Magnetic Particles

PROTEIN ENRICHMENT

Sera-Mag™ Streptavidin, Sera-Mag™ SpeedBeads Streptavidin and Sera-Mag™ SpeedBeads NeutrAvidin™-Coated Magnetic Particles combine fast reaction kinetics and low, nonspecific binding for increased throughput, precision and solid phase support in a variety of immunoassay and molecular biology applications. These include sample preparation and assay development for genomics and proteomics applications.

- Low dissociation constant (K_d 10^{-15} M) to tightly bind ligands.
- Covalently bound to prevent leaching from the surface.
- Even coating of SA or NA protein for reliable results.
- Multiple biotin binding capacities available for optimizing assay development (Sera-Mag™ Streptavidin only).
- Stability in biological buffer systems optimizes reagent development.
- No carbohydrate reduces nonspecific binding caused by sugars (NeutrAvidin™ only).
- Fast movement through viscous solutions.

Nominally 1 micron in diameter, Sera-Mag™ magnetic beads are well-suited for the majority of biological applications, and due to their superparamagnetic properties, they are very easy to handle. A core polystyrene particle is coated with magnetite, which is then encapsulated using a proprietary polymer to provide a suitable surface which is the basis for all Sera-Mag™ beads. A second layer of magnetite is applied, followed by further encapsulation, to form Sera-Mag™ SpeedBeads, which generate a faster magnetic response for viscous substrates or where speed to magnet is required (Figs 1 and 2).

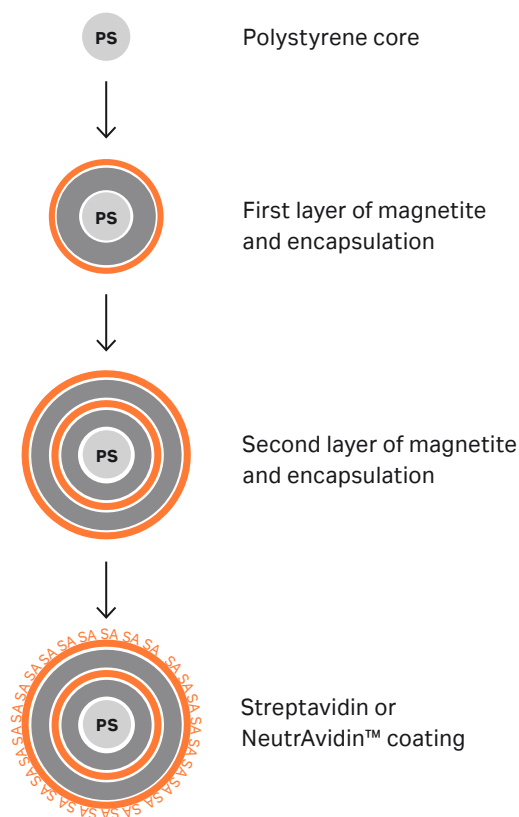


Fig 1. Sera-Mag™ SpeedBeads magnetic particles are made by a modified Sera-Mag™ process in which a larger quantity of magnetite is added as a second layer within the particle, resulting in a 2x-faster increase in speed in response to a magnetic field.

Compounds that are difficult to attach to particle surfaces by conventional means may be amenable to biotinylation. Streptavidin-Coated and NeutrAvidin™-Coated SpeedBeads are available with a 3500–4500 pmol/mg biotin-binding range.



Fig 2. Image developed from a scanning electron microscopy (SEM) showing the cauliflower-like surface of the Sera-Mag™ SpeedBeads magnetic particles. In addition to its high carboxylic acid content, the surface dramatically increases the overall surface area available for binding.

Streptavidin-coated and NeutrAvidin™-coated magnetic particles in molecular biology

Achieving high activity and stable binding of biological ligands to magnetic beads can often be technically challenging. Where direct conjugation to the bead surface is either unsuccessful or impractical, adoption of streptavidin-coated magnetic particles can provide a suitable and more convenient alternative where the ligand itself is biotinylated and captured on the bead surface. Standard protocols are available to biotinylate a wide range of ligands including proteins, nucleic acids, haptens, peptides, and other molecules.

Sera-Mag™ Streptavidin-Coated magnetic particles

The original Sera-Mag™ Streptavidin magnetic beads provide robust performance in a range of immunoassay and molecular biology techniques, exhibiting a high affinity when binding to biotinylated ligands such as proteins, nucleic acids and peptides. There are three different capacity ranges that provide flexibility to meet different needs (Table 1).

Sera-Mag™ SpeedBeads Streptavidin-Coated magnetic particles

Streptavidin-Coated SpeedBeads provide a high biotin-binding capacity along with a strong affinity for targeted, biotin-labeled molecules, providing an ideal solid phase support for immunoassays and molecular biology applications.

Sera-Mag™ SpeedBeads Streptavidin-Blocked Magnet Particles

Sera-Mag™ SpeedBeads Streptavidin-Blocked Magnetic Particles are designed for demanding applications where high binding capacity and low non-specific binding are essential to meet the required levels of performance. Unlike other blocked beads, Sera-Mag SpeedBeads Streptavidin-Blocked beads have a chemically coated surface that reduces the non-specific adsorption of non-targeted molecules. The coupling procedure provides a uniform monolayer of streptavidin molecules across the surface. The SpeedBeads format also provides fast magnetic response time adding convenience and ease of use.

Sera-Mag™ SpeedBeads NeutrAvidin™-Coated Magnetic Particles

Sera-Mag™ SpeedBeads NeutrAvidin™-Coated Magnetic Particles use an alternative ligand for the binding of biotinylated targets or baits. NeutrAvidin™, derived from avidin, retains the same binding characteristics as streptavidin, but is processed to remove oligosaccharides and to lower the isoelectric point to nearly neutral. As such, NeutrAvidin™ offers the lowest non-specific binding, especially with negatively charged cell surfaces and nucleic acids, making it well-suited for a wide array of applications where non-specific binding is critical.

Table 1. Sera-Mag™ magnetic beads come in a range of formats with different binding capacities, magnetic response times and surface chemistries

Product code	Description	Binding capacity (pmol biotin/mg bead)	Concentration (% bead solids w/w)
30152103010350	Sera-Mag™ Streptavidin-Coated	2333-3545	0.9-1-1
30152104010350	Sera-Mag™ Streptavidin-Coated	3546-4454	0.9-1-1
30152105010350	Sera-Mag™ Streptavidin-Coated	4455-6091	0.9-1-1
66152104010350	Sera-Mag™ Speedbeads Streptavidin-Coated	3431-5357	0.9-1-1
21152104010350	Sera-Mag™ Speedbeads Streptavidin-Blocked	2500-5000	0.9-1-1
78152104010350	Sera-Mag™ Speedbeads NeutrAvidin™-Coated	3000-4000	0.9-1-1

Capture of BSA and IgG using Sera-Mag™ Streptavidin-Coated magnetic beads

To give an indication of binding capacity of Sera-Mag™ magnetic beads in biological applications, BSA (MWt 66.4kDa) and IgG (MWt 150kDa) were each biotinylated and captured to saturation using different Sera-Mag™ magnetic beads, and the values reported in Table 2.

Table 2. Testing results showed the broad range of binding capacities for current Sera-Mag™ beads for biotinylated IgG is around 40–80 µg IgG/mg bead

Sera-Mag™ bead type	Biotin-fluorescein binding (pmol/mg bead)	Biotin-BSA binding (µg/mg bead)	Biotin-IgG binding (µg/mg bead)
Sera-Mag™ Streptavidin 2500 to 3500 (Low) pmol per mg	2979	18.0	40.6
Sera-Mag™ Streptavidin 3500 to 4500 (Med.) pmol per mg	4030	28.2	58.9
Sera-Mag™ Streptavidin 4500 to 5500 (High) pmol per mg	5163	30.6	63.9
Sera-Mag™ Streptavidin 3500 to 4500 (Med.) pmol per mg	4261	36.5	77.7
Sera-Mag™ SpeedBeads Streptavidin-Blocked Magnetic Particles	3706	29.9	58.9

Effect of heating on biotin-streptavidin binding

Streptavidin-based magnetic particles are often heated during use and the biotin-streptavidin bond is considered irreversible in all but extreme circumstances. Like all proteins, streptavidin is subject to denaturation if heated to elevated temperatures, and once denatured, streptavidin is not effective at binding biotinylated species. As temperature increases above 70°C, binding capabilities begin to drop (Fig 5).

Streptavidin beads: effect of a 3-minute heating cycle on binding capacity

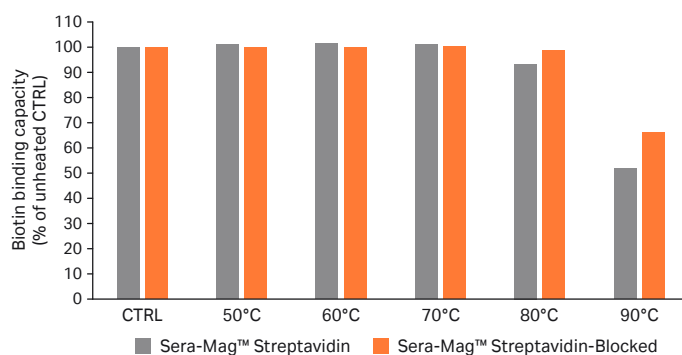


Fig 5. Binding capacities remain unaffected at temperatures up to 70°C, with significant reduction at 90°C.

However, where streptavidin is pre-bound with a ligand before heating, it has been shown to add stability: the interaction is able to withstand higher temperatures. Sera-Mag™ Streptavidin-Coated beads were bound to capacity with biotin and subjected to heating beyond the point of denaturation of native streptavidin to investigate retention of the binding capacity (Fig 6).

Streptavidin beads: effect of 90°C heating times on pre-bound reagent

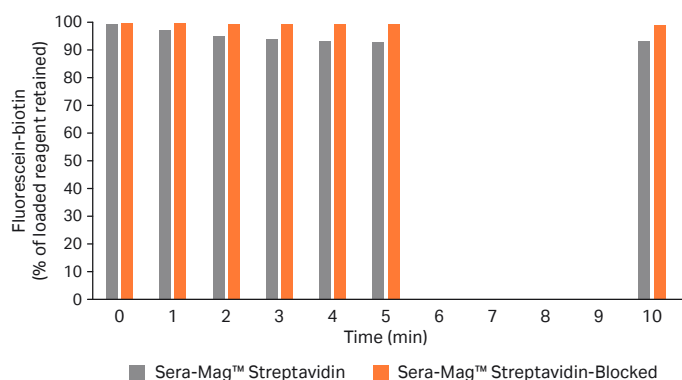


Fig 6. Compared to the significant reductions in binding capacity post-heating observed previously, the retention of pre-loaded ligand at the elevated temperature is much less affected. Only very low levels of fluorescein absorbance were detected in the post-heating supernatants, indicating >90% retention at 90°C for 10 minutes.

Use of streptavidin and other similar ligands to capture biotinylated targets or bait molecules is common in the biological sciences, from immunodiagnostic assay development to target enrichment in nucleic acid sequencing, each requiring slightly different characteristics. The range of Sera-Mag™ Streptavidin- and NeutrAvidin™-coated magnetic beads enables the user to select the most suitable bead for their chosen application to optimize results.

Specifications

	Streptavidin	NeutrAvidin™
Particle composition		
Sera-Mag™ SpeedBeads	Double layer of magnetite	Double layer of magnetite
Sera-Mag™	Single layer of magnetite	N/A
Final encapsulation	Polymer with covalently conjugated streptavidin groups	Polymer with covalently conjugated NeutrAvidin™ groups
Particle density		
Sera-Mag™ SpeedBeads	~2.0 g/cm ³	~2.0 g/cm ³
Sera-Mag™	~1.7 g/cm ³	N/A
Magnetite content		
Sera-Mag™ SpeedBeads	~60%	~60%
Sera-Mag™	~40%	N/A
Protein surface		
Molecular weight	53 000	60 000
Number of binding sites	4	4
Isoelectric point (pH)	5.5	6.3
Biotin binding capacity (pmol/mg)		
Low	2500–3500	
Medium	3500–4500	3500–4500
High	4500–5500	
Product attributes		
Nominal diameter	1 µm	1 µm
pH stability	4 to 11	4 to 11
Additives	0.05% sodium azide	0.05% sodium azide
Storage conditions	Unless otherwise stated, refrigerate (2°C to 8°C) product when not in use, but do not freeze. Store upright and keep bottle tightly sealed. Mix product with gentle inversion by hand or vortex mixer.	

Ordering information

Product name	Pack size*	Product code	Related products	Pack size	Product code
Sera-Mag™ Streptavidin-Coated magnetic particles (Low)	1 mL	30152103011150	Sera-Mag™ SpeedBead Carboxylate-Modified [E7] Magnetic Particles	15 mL	45152105050250
	5 mL	30152103010150		100 mL	45152105050350
	100 mL	30152103010350		1000 mL	45152105050450
Sera-Mag™ Streptavidin-Coated magnetic particles (Med.)	1 mL	30152104011150	Sera-Mag™ SpeedBead Carboxylate-Modified [E3] Magnetic Particles	15 mL	65152105050250
	5 mL	30152104010150		100 mL	65152105050350
	100 mL	30152104010350		1000 mL	65152105050450
Sera-Mag™ Streptavidin-Coated magnetic particles (High)	1 mL	30152105011150	Sera-Mag™ Carboxylate-Modified [E7] Magnetic Particles	15 mL	24152105050250
	5 mL	30152105010150		100 mL	24152105050350
	100 mL	30152105010350		1000 mL	24152105050450
Sera-Mag™ SpeedBeads Streptavidin-Coated magnetic particles (Med.)	1 mL	66152104011150	Sera-Mag™ Carboxylate-Modified [E3] Magnetic Particles	15 mL	44152105050250
	5 mL	66152104010150		100 mL	44152105050350
	100 mL	66152104010350		1000 mL	44152105050450
Sera-Mag™ SpeedBeads Streptavidin-Blocked Magnetic Particles	1 mL	21152104011150	SeraSil-Mag™ 400	5 mL	29357369
	5 mL	21152104010150		60 mL	29357371
	100 mL	21152104010350		450 mL	29357372
Sera-Mag™ SpeedBeads NeutrAvidin™-Coated Magnetic Particles (Med.)	1 mL	78152104011150	SeraSil-Mag™ 700	5 mL	29357373
	5 mL	78152104010150		60 mL	29357374
	100 mL	78152104010350		450 mL	29357375
			MagRack 6	1.5 mL / 2.0 mL microtubes	28948964

*Larger volumes are available on request

For more information on magnetic bead chemistries, handling properties and applications, visit our 'Scientist's Guide to Magnetic Beads'.

cytiva.com/sera-mag

For local office contact information, visit cytiva.com/contact

Cytiva and the Drop logo are trademarks of Life Sciences IP Holdings Corp. or an affiliate doing business as Cytiva. Sera-Mag and SeraSil-Mag are trademarks of Global Life Sciences Solutions USA LLC or an affiliate doing business as Cytiva.

NeutrAvidin is a trademark of ThermoFisher Scientific. Any other third-party trademarks are the property of their respective owners.

© 2020–2022 Cytiva

CY15384-19Apr22-DF

