# SeraSil-Mag™ silica beads

SILICA COATED SUPERPARAMAGNETIC PARTICLES FOR NUCLEIC ACID ISOLATION

SeraSil-Mag™ silica coated superparamagnetic particles are designed for nucleic acid isolation and diagnostic extraction applications for a range of samples, from biofluids to liquid biopsy, even when trace amounts of DNA are available. SeraSil-Mag™ beads provide an optimal surface for DNA binding with high performance and low background for highly sensitive applications.

SeraSil-Mag™ silica particles exhibit high magnetization in the presence of a magnetic field (superparamagnetic) and have a fast magnetic response rate of ~5 seconds. At the same time, they provide good buoyancy stability, with beads well-suspended and dispersed after standing for >90 mins at 1 mg/mL concentration. SeraSil-Mag™ beads are compatible with chaotropic salt chemistry.

SeraSil-Mag™ beads are provided as monodispersed suspension in 0.05% W/V sodium azide. It is available in two submicron particle sizes (700 nm and 400 nm in diameter), and is compatible with vortex mixing, roller mixing and sonication.

The standard DNA extraction process is shown in Figure 1.

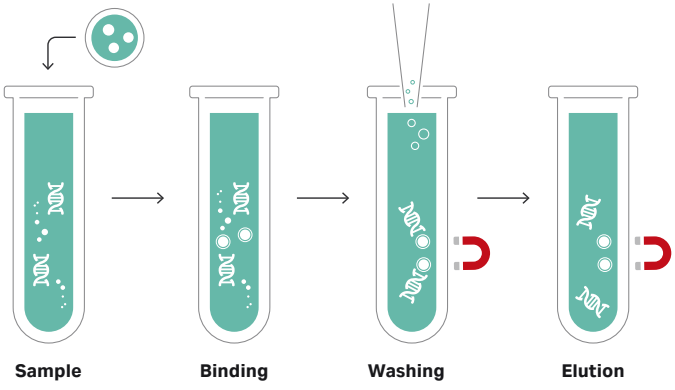



**Fig 1.** Standard extraction process with SeraSil-Mag™ beads.

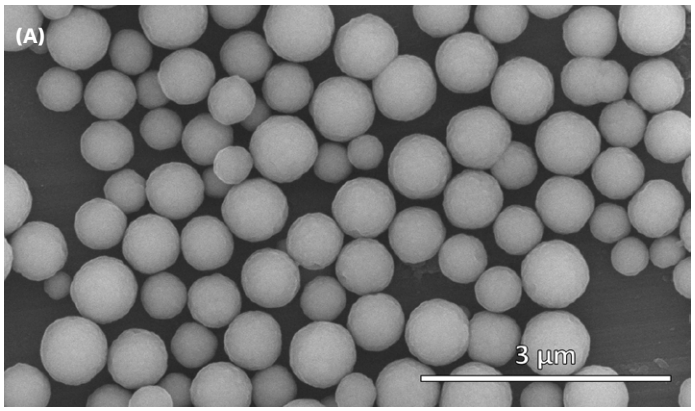

## Uniformity of particle size and composition

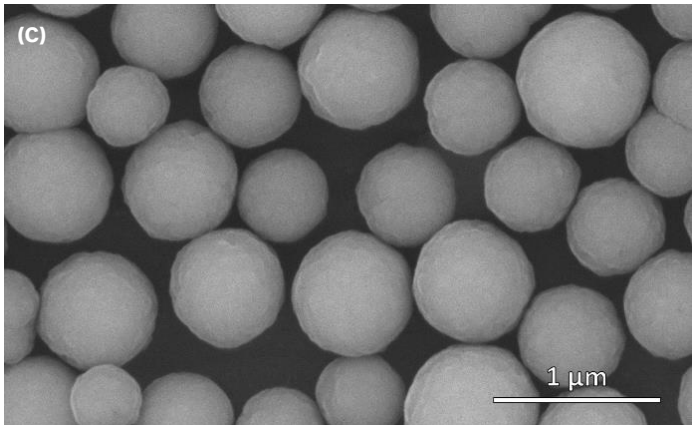
Tightly controlled production processes result in core-shell beads which are uniform and spherical. The silica shell provides a high content of silanol surface groups and encloses the magnetic core, as confirmed by Fourier-Transformed Infrared (FT-IR) spectroscopy. The submicron size allows for a high surface area and abundant binding sites. The narrow particle size distribution provides uniformity and consistency of the beads, as shown in Figure 2 and Figure 3.

The high zeta-potential values indicate a high surface charge, allowing for monodispersity and stable suspensions (long gravity settling time/low sedimentation rate) which contribute to ease of handling during use. As a result, SeraSil-Mag™ beads deliver a high-performance surface and regular morphology to optimize binding efficiency and reduce variability.

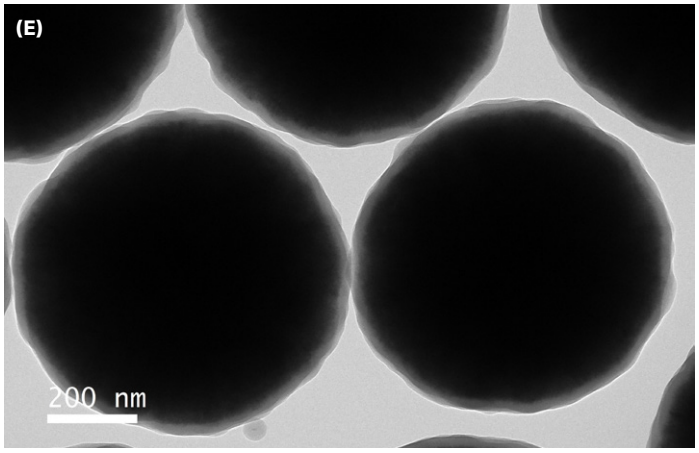
**SeraSil-Mag™ 700 beads**
**Particle size: ~700 nm**

Scanning electron microscopy (SEM)



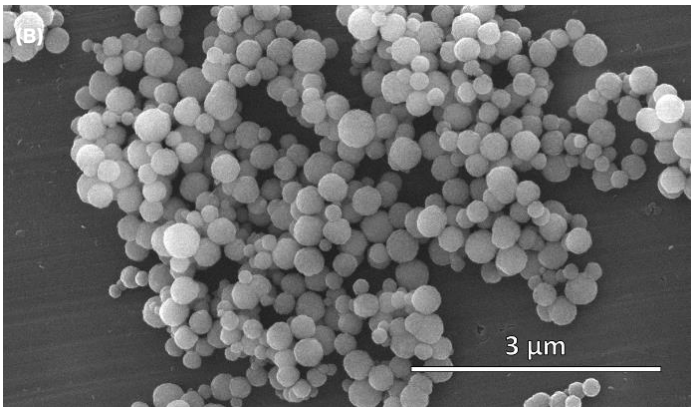



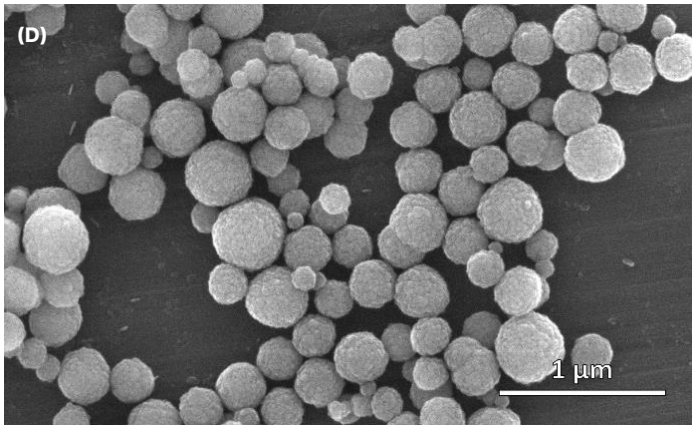

Transmission electron microscopy (TEM)




**SeraSil-Mag™ 400 beads**
**Particle size: ~400 nm**

Scanning electron microscopy (SEM)




Transmission electron microscopy (TEM)

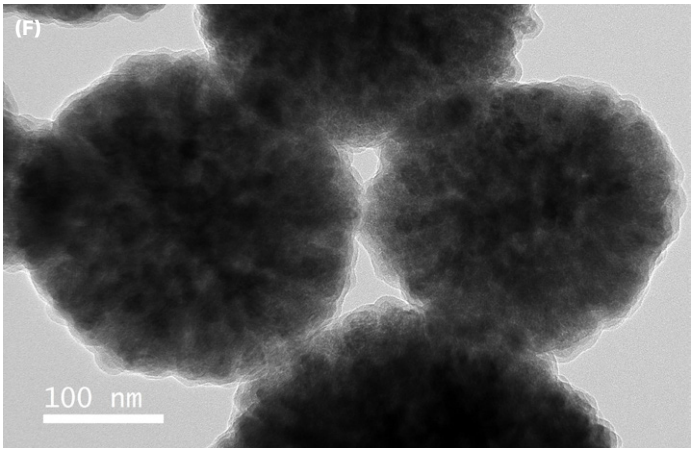
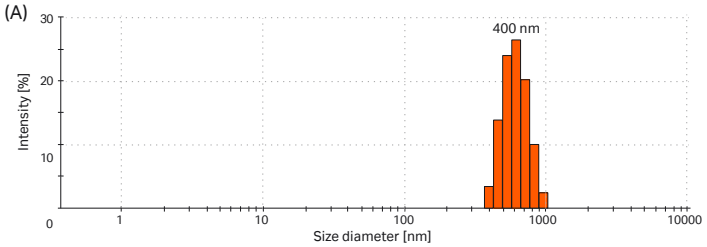
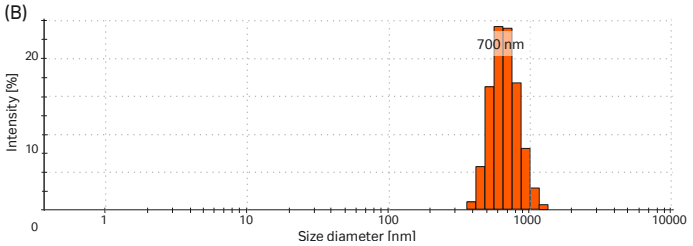



**Fig 2.** Electron microscopy images showing particle size uniformity and distribution at different magnifications. Scanning Electron Microscopy (SEM) for SeraSil-Mag™ 700 beads (A, C) and SeraSil-Mag™ 400 beads (B, D). Transmission Electron Microscopy (TEM) for SeraSil-Mag™ 700 beads (E) and SeraSil-Mag™ 400 beads (F).

## Particle size distribution via dynamic light scattering (DLS)




Monodispersity (one narrow peak)
Mean diameter size 400 nm




Monodispersity (one narrow peak)
Mean diameter size 700 nm

**Fig 3.** Particle size distribution of SeraSil-Mag™ beads via dynamic light scattering (DLS). SeraSil-Mag™ 400 beads (A); SeraSil-Mag™ 700 beads (B).

# Magnetic settling

The magnetic nanoparticles within the core provide superparamagnetic properties to the SeraSil-Mag™ beads, resulting in extremely fast magnetic separation in the presence of a magnet. There is no residual magnetization when the magnetic field is removed, which further contributes to ease of handling during use.

Magnetic settling expressed as separation time on a SepMag™ biomagnetic separator is shown in Figure 4, opposite.

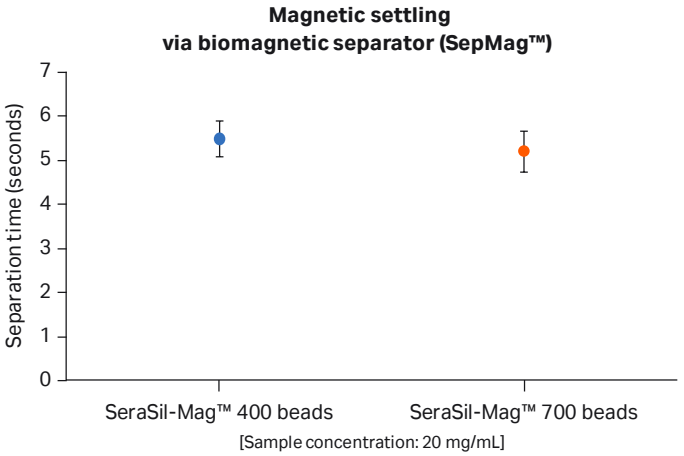



**Fig 4.** Magnetic separation time in seconds via SepMag™ biomagnetic separator. Experimental conditions: sample concentration, 20 mg/mL in water, as provided; sample volume, 5 mL.

# DNA recovery and purity

SeraSil-Mag™ beads can be used for extraction of nucleic acids using the appropriate protocol and buffers, such as chaotropic salts, for binding and extraction. SeraSil-Mag™ silica beads can be used to isolate and purify genomic DNA from whole human blood with yields up to 8 µg of genomic DNA from a 200 µL aliquot of human blood, $A_{260}/A_{280}$ absorbance ratio between 1.70-1.90 and $A_{260}/A_{230}$ ratios as high as 2.

The genomic DNA recovery and purity performance of SeraSil-Mag™ magnetic particles was compared with MagAttract™ HMW DNA Mini Kit, which is also based on silica bead technology. The results are shown in Figure 5, below.

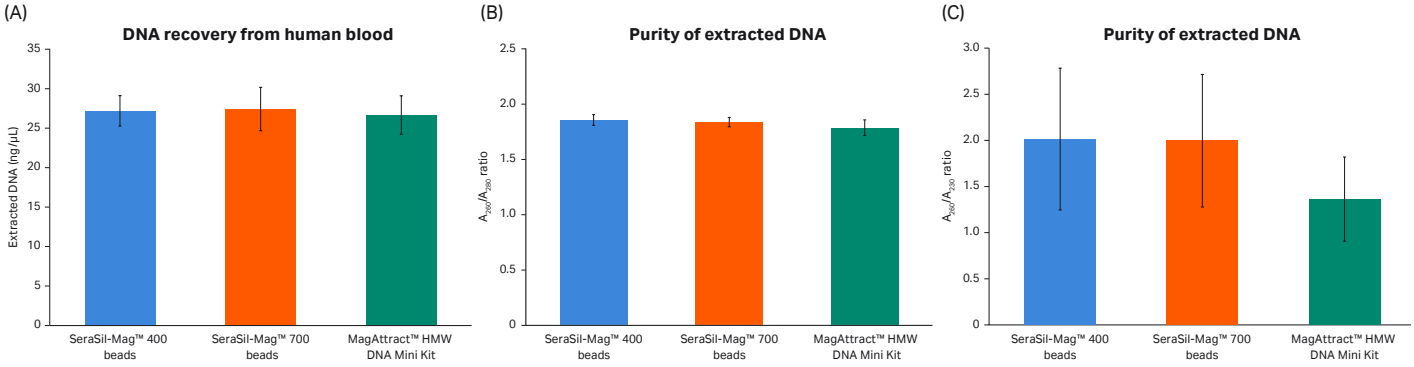



**Fig 5.** SeraSil-Mag™ beads were tested alongside MagAttract™ HMW DNA Mini Kit from QIAGEN. SeraSil-Mag™ beads have been used at the same working concentration as the silica beads contained in the MagAttract™ kit. The QIAGEN protocol was followed and the buffers provided in the kit were used. (A) DNA extracted from human blood, ng/µL. (B) Purity of extracted DNA, $A_{260}/A_{280}$ ratio. C. Purity of extracted DNA, $A_{260}/A_{230}$ ratio.

Data is based on three replicate trials including multiple replicates and operators. All three samples tested were treated equally. Data was collected at Cytiva, Maynard Centre, Cardiff, UK (R&D Laboratory) during September/October 2018 and is held at this location.

# Product data

| Product | Concentration | Storage condition | Particle size | Magnetization | Surface functional group | Zeta potential |
|---|---|---|---|---|---|---|
| SeraSil-Mag™ 400 beads | 20 mg/mL (in water, containing 0.05% sodium azide) | Room temperature | 400 nm | Superparamagnetic (60 emu/g) | -OH | -30 mV (or above in absolute value) |
| SeraSil-Mag™ 700 beads | 20 mg/mL (in water, containing 0.05% sodium azide) | Room temperature | 700 nm | Superparamagnetic (60 emu/g) | -OH | -35 mV (or above in absolute value) |

# Ordering information

| Product | Quantity | Product code |
|---|---|---|
| SeraSil-Mag™ 400 Silica Beads | 5 mL | 29357369 |
| | 60 mL | 29357371 |
| | 450 mL | 29357372 |
| | 1000 mL | 29705862 |
| SeraSil-Mag™ 700 Silica Beads | 5 mL | 29357373 |
| | 60 mL | 29357374 |
| | 450 mL | 29357375 |
| | 1000 mL | 29705861 |

| Related products | Quantity | Product code |
|---|---|---|
| Sera-Mag™ SpeedBead Carboxylate-Modified [E7] Magnetic Particles | 15 mL | 45152105050250 |
| | 100 mL | 45152105050350 |
| | 1000 mL | 45152105050450 |
| Sera-Mag™ SpeedBead Carboxylate-Modified [E3] Magnetic Particles | 15 mL | 65152105050250 |
| | 100 mL | 65152105050350 |
| | 1000 mL | 65152105050450 |
| Sera-Mag™ Carboxylate-Modified [E7] Magnetic Particles | 15 mL | 24152105050250 |
| | 100 mL | 24152105050350 |
| | 1000 mL | 24152105050450 |
| Sera-Mag™ Carboxylate-Modified [E3] Magnetic Particles | 15 mL | 44152105050250 |
| | 100 mL | 44152105050350 |
| | 1000 mL | 44152105050450 |
| Sera-Mag™ Select size selection and PCR clean-up reagent | 5 mL | 29343045 |
| | 60 mL | 29343052 |
| | 450 mL | 29343057 |
| MagRack 6 | | 28948964 |
| MagRack Maxi | | 28986441 |

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