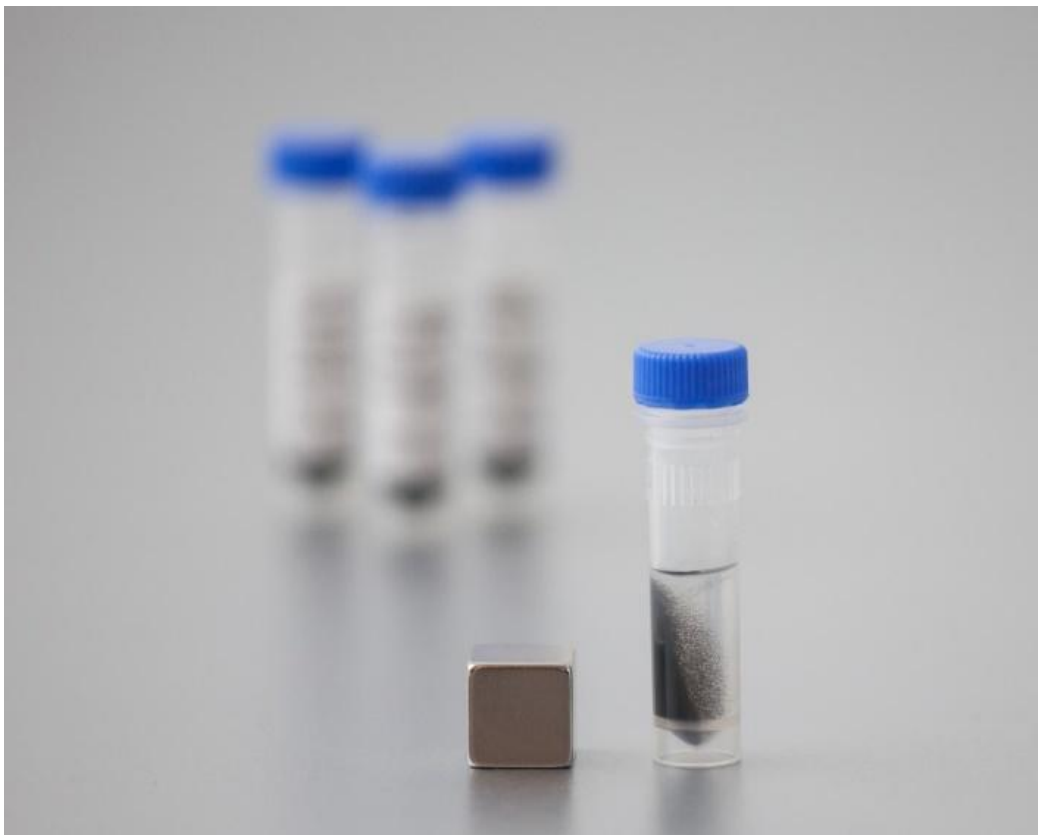
MAGic™ BioProcessing

DATA SHEET

MAGic™Beads ACT



- Super-paramagnetic porous beads
- Custom coupling of 10-30 mg protein/mL
- Minimal non-specific interaction

MAGicBeads ACT

MAGicBeads ACT consists of super-paramagnetic 4% agarose beads, which are functionalized for covalent coupling of molecules with primary amino and thiol groups, such as proteins and peptides. Subsequently, target molecules can be affinity purified using magnetic separation technology.

The MAGicBeads ACT magnetic agarose beads show outstanding magnetic behavior and are easily attracted to external magnets, allowing separation within seconds. The agarose matrix minimizes nonspecific binding of proteins due to its hydrophilic nature. The black beads are easily observed by the naked eye, making them easy to collect. The beads do not aggregate.

Our patented coupling technology allows rapid covalent linking of ligands to the beads under mild conditions in water-based media. The beads couple 10-30 mg IgG per mL settled beads and 5–7.5 mg Protein A per mL settled beads. The bond is very stable (6 ppm leakage of Protein A).

Table 1. Main characteristics of MAGicBeads ACT

Product	MAGicBeads ACT, 10% bead suspension
Coupling to	Primary amino and thiol groups
Matrix	Super-paramagnetic porous agarose
Particle size	50–150 µm
Average particle size (DV50)[1]	90 µm
Coupling capacity[2]	5–10 mg IgG/mL settled beads
Coupling buffer	PBS with 0.1% Tween® 20
Storage	+2 to +8°C in 20% ethanol. Do not freeze

[1] The median particle size of the cumulative volume distribution

[2] Coupling capacity was determined by incubating 0.1 mL MAGicBeads ACT with rabbit IgG (1 mg/mL in 2 mL PBS) for 60 minutes at room temperature.

Applications

Principle

MAGicBeads ACT are magnetic pre-activated agarose beads designed for affinity applications that require covalent attachment of custom ligands, including peptides and proteins. The beads provide reactive groups that enable stable coupling through primary amines and/or thiol functionalities on the target ligand. These 90 µm super-paramagnetic agarose beads are optimized for biomolecule purifications and other bioseparation/detection workflows.

Coupling capacity

The beads typically have a coupling capacity of 10–20 mg protein or 2–4 mg peptide per mL of settled beads, which is achieved within about 1 hour at ~90% yield. Figure 1 shows the amount of IgG coupled as a function of the IgG added to the reaction.

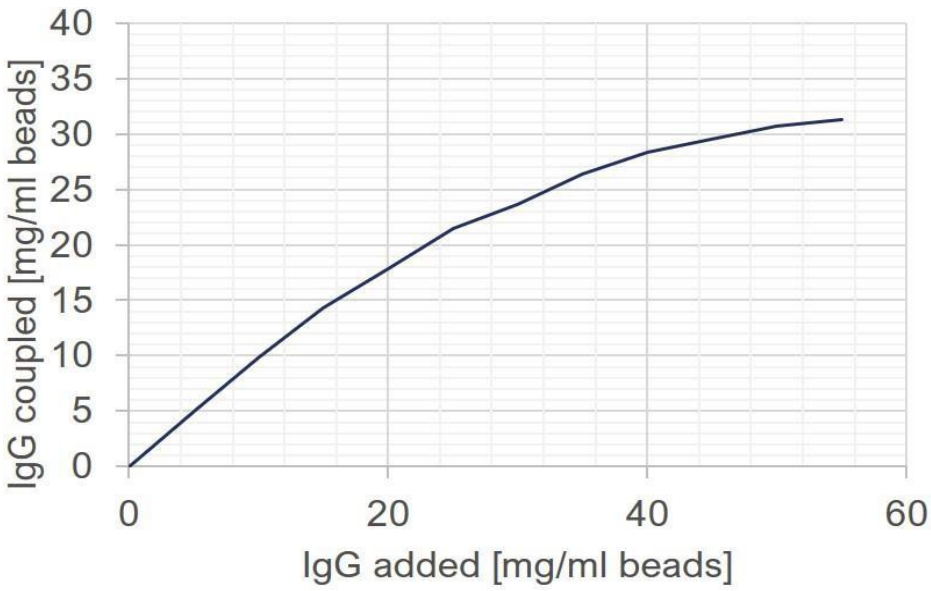


Figure 1. Coupling capacity assay for polyclonal rabbit IgG to the MAGicBeads ACT. Coupling for 1 hour with end-over-end mixing at room temperature

Immunoaffinity purification of anti-rabbit IgG

In this study, we covalently coupled rabbit IgG to MAGicBeads ACT magnetic beads and subsequently used these modified beads to purify goat anti-rabbit IgG from serum.

Coupling

Rabbit IgG (1 mg in PBS) was incubated with 0.1 mL settled MAGicBeads ACT for 1 hour, with sampling to monitor coupling efficiency (Figure 2). After coupling was complete, remaining active groups were blocked with 50% ethanolamine, and the beads were processed as instructed. A 94% coupling efficiency was achieved within 1 hour.

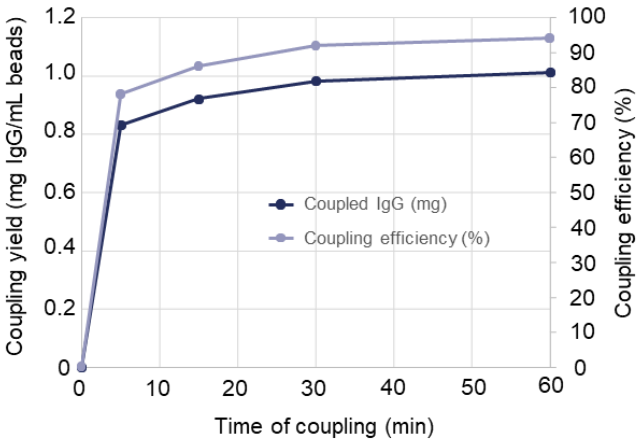
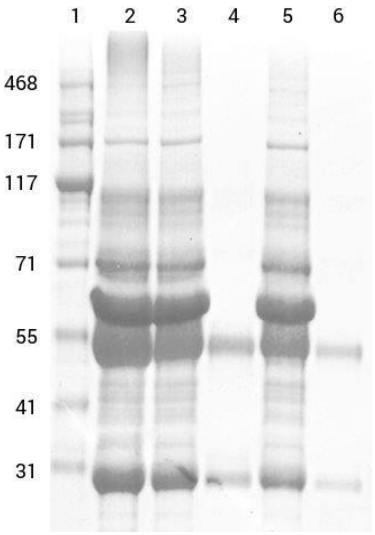


Figure 2. Coupling of rabbit IgG to MAGicBeads ACT is sufficiently completed within 1 hour. Coupled IgG (dark blue) and coupling efficiency (light blue) were analyzed after 5, 15, 30 and 60 minutes.

Capture

The IgG-coupled beads were then used to purify anti-rabbit IgG from goat serum. One mL of goat serum was incubated with 0.1 mL of pre-washed MAGicBeads ACT–rabbit IgG for 1 hour, followed by washing and elution with 0.5 mL of 60 mM citrate, pH 3.0. Two sequential purification runs were carried out, with bead cleaning (0.1% Tween 20 in PBS) between cycles.



Each run yielded approximately 0.5 mg of polyclonal goat anti-rabbit IgG. SDS-PAGE analysis under reducing conditions showed that both purifications produced antibodies of similarly high purity (Figure 3).

Figure 3. SDS-PAGE gel electrophoresis. Anti-rabbit IgG purified from goat anti-serum with MAGicBeads ACT. 1. Protein molecular weight, 2. Input goat serum, 3. Flowthrough goat serum first run, 4. Purified anti-rabbit IgG first run, 5. Flowthrough goat serum second run. 6. Purified anti-rabbit IgG second run.

Affinity purification of disease biomarkers

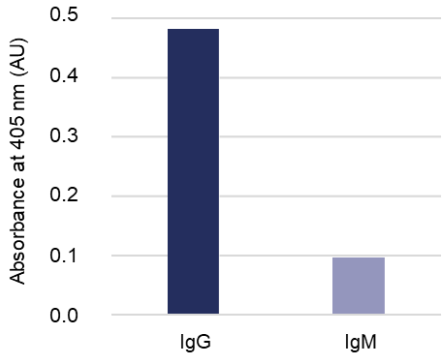
The synthetic glycopeptide CSF114(Glc), a known binder of MS-associated autoantibodies, was immobilized on MAGicBeads ACT and evaluated for its ability to purify autoantibodies from serum of a patient with multiple sclerosis.

Coupling For coupling, CSF114(Glc) was dissolved in D-PBS and incubated with MAGicBeads ACT for 3 hours. Afterward, the beads were washed twice and remaining active groups were quenched with 50% ethanolamine before final processing. This procedure yielded approximately 0.15 mg glycopeptide coupled to 0.1 mL of beads, corresponding to ~1.5 mg per mL of beads.

Capture The CSF114(Glc)-coupled beads were then incubated with MS patient serum for 2 hours at room temperature. Following removal of the supernatant, the beads were washed with D-PBS, and bound autoantibodies were eluted in two sequential elution steps. Experimental details are summarized in Table 2.

Table 2. Experimental conditions for capture

Magnetic beads	MAGicBeads ACT coupled with CSF114(Glc)
Sample	Patient serum
Bead volume	0.1 mL (1 mL 10% bead suspension)
Sample volume	2 mL (serum diluted 1:1 in D-PBS (pH 7.2) and filtered at 0.22 µm)
Magnetic separator	MAGicAccio LAB
Binding conditions	D-PBS (pH 7.2), 2 h, RT, shaking
Elution conditions	2x1 mL 100 mM Gly-HCl* (pH 2.5) 15 min



A custom ELISA confirmed the presence of glycopeptide CSF114(Glc) reactive IgG and IgM in the eluate (Figure 4). Measurements at 280 nm indicated a total yield of 0.77 mg CSF114(Glc)-positive antibodies.

Figure 4. Non-quantitative ELISA of glycopeptide CSF114(Glc) reactive material. Levels are expressed as arbitrary units at absorbance 405 nm

In conclusion, coupling the synthetic glycopeptide CSF114(Glc) to MAGicBeads ACT under mild, physiological conditions provides an effective approach for purifying autoantibodies from patients with multiple sclerosis.

Super-paramagnetism

MAGicBeads are super-paramagnetic, where the magnetic separation occurs within seconds at small scale (1 mL), due to our novel proprietary production method. These beads are easily resuspendable without forming any aggregates facilitating the separation process. This is due to the property of the agarose beads being hydrophilic and the lack of a magnetic memory. These properties speed up the protocols at all scales.

Scale-up

The beads are suitable for separations using appropriate magnetic separators, such as the MAGicAccio LAB (Product No. 2000, 2100), MAGicAccio PILOT 50 (Product No. 2200), MAGicAccio PILOT 500 (Product No. 2300), MAGicAccio PILOT 2000 (Product No. 2400) and MAGicAccio PROCESS.

These separators vary from lab scale to medium scale/process development up to large scale/bioprocessing scale.

Cleaning-in-place/ sanitation

Ligand-coupled beads can accumulate contaminants from the sample feed, such as cell debris, lipids, nucleic acids, protein precipitates and other process-related impurities which may reduce performance over time. The extent of fouling depends on the sample type and its pre-treatment. Regular cleaning (CIP) helps keep the beads free of buildup, slows further contamination, and maintains capacity.

CIP protocols should be tailored to the sample and the stability of the ligand. Stable ligands generally tolerate stronger cleaning conditions, such as 0.1–1 M NaOH, while more sensitive ligands may require non-ionic detergents.

During purification, host-cell impurities may bind non-specifically to the beads, lowering capacity. Routine CIP removes these impurities and restores bead performance. A typical CIP treatment is incubation with up to 0.5 M NaOH for 15 minutes. Water rinses before and after the CIP step are recommended.

The coupled beads can be reused multiple times without loss of capacity or specificity, provided they are cleaned regularly and properly.

Storage

The MAGicBeads ACT should be stored as a 10% bead suspension at +2 to +8°C in 20% ethanol.

Ordering information

Products	Quantity	Product No.
MAGicBeads ACT	1 mL beads	1300
MAGicBeads ACT	10 mL beads	1301
MAGicBeads ACT	50 mL beads	1305
MAGicBeads ACT	100 mL beads	1310
MAGicBeads ACT	250 mL beads	1325
MAGicBeads ACT	500 mL beads	1350

Related products	Product No.
MAGicBeads custom	10XX
MAGicAccio LAB rack	2000
MAGicAccio LAB cube	2100
MAGicAccio PILOT 50	2200
MAGicAccio PILOT 500	2300
MAGicAccio PILOT 2000	2400
MAGicAccio PROCESS	3100

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