

1 μ m Titanium Dioxide Magnetic Beads (Thin Shell)

Cat. No.: T1520785 | Pack size: 1 mL, 10 mL | Storage: Store at 2-8°C, Desiccated, Do not freeze

Overview

Phosphorylation is a common reversible post-translational modification that plays a regulatory role in numerous biological processes such as cell signaling, and therefore holds significant importance in research on many diseases, including tumors. Understanding phosphorylation aids in comprehending disease pathogenesis. Phosphoproteins and phosphopeptides are typically present in very low concentrations and exhibit poor ionization efficiency, making them difficult to detect by mass spectrometry (MS). Consequently, there is an urgent need for enrichment technologies that can specifically enrich phosphopeptides and are compatible with mass spectrometry analysis.

Titanium dioxide possesses selective affinity for enriching phosphoserine (pSer), phosphothreonine (pThr), and phosphotyrosine (pTyr) residues. TiO_2 magnetic beads are a proprietary particulate carrier of magnetic material that enable simple, convenient, efficient, highly specific, and highly reproducible enrichment of phosphopeptides from protein digests of complex biological samples. The TiO_2 nanoparticles on the bead surface show no significant preference for monophosphorylated versus multiphosphorylated peptides, making them highly suitable for single-step phosphopeptide enrichment for mass spectrometry-based proteomics analysis. Additionally, TiO_2 magnetic beads can be used to isolate extracellular vesicles (EVs), such as exosomes, by binding to the phospholipid bilayer membrane. TiO_2 captures small EVs (sEVs) by forming a bidentate structure with the phosphate groups of the EV bilayer phospholipids, while the magnetic core enables further separation of the bead-sEV complexes. The binding between the beads and EVs is reversible; the captured sEVs can be eluted and collected by washing with an alkaline solution.

Aladdin offers two types of titanium dioxide magnetic beads: Titanium Dioxide Magnetic Beads (Thin Shell) and Titanium Dioxide Magnetic Beads (Thick Shell). The Titanium Dioxide Magnetic Beads (Thin Shell) are monodisperse micron-sized beads with uniform size, featuring a nanoscale rough island-like surface structure, high specific surface area, strong saturation magnetization, and fast magnetic response time. The Titanium Dioxide Magnetic Beads (Thick Shell) have a thicker titanium dioxide shell coating, providing enhanced stability suitable for use in more rigorous chemical environments. Titanium dioxide magnetic beads combine the advantages of rapid magnetic field response of magnetic materials and the stability of metal oxides, offering high specific surface area, simplifying the phosphopeptide enrichment process, and increasing enrichment throughput.

Cat. No.	T1520785	T1520786
Product Name	1 μ m Titanium Dioxide Magnetic Beads (Thin Shell)	1 μ m Titanium Dioxide Magnetic Beads (Thick Shell)
Hydrodynamic Size	1000 $\pm$ 200 nm	1000 $\pm$ 200 nm
Zeta Potential	$\leq$ -20 mV	$\leq$ -20 mV

Cat. No.	T1520785	T1520786
Magnetic Content (Iron Oxide)	≥ 10%	≥ 10%
Solvent	Pure Water	Pure Water
Concentration	25 mg/mL	25 mg/mL

1. Product Morphology and Size

The average size of Titanium Dioxide Magnetic Beads (Thin Shell) is 1.20 μm (left image), and the average size of Titanium Dioxide Magnetic Beads (Thick Shell) is 1.45 μm (right image).

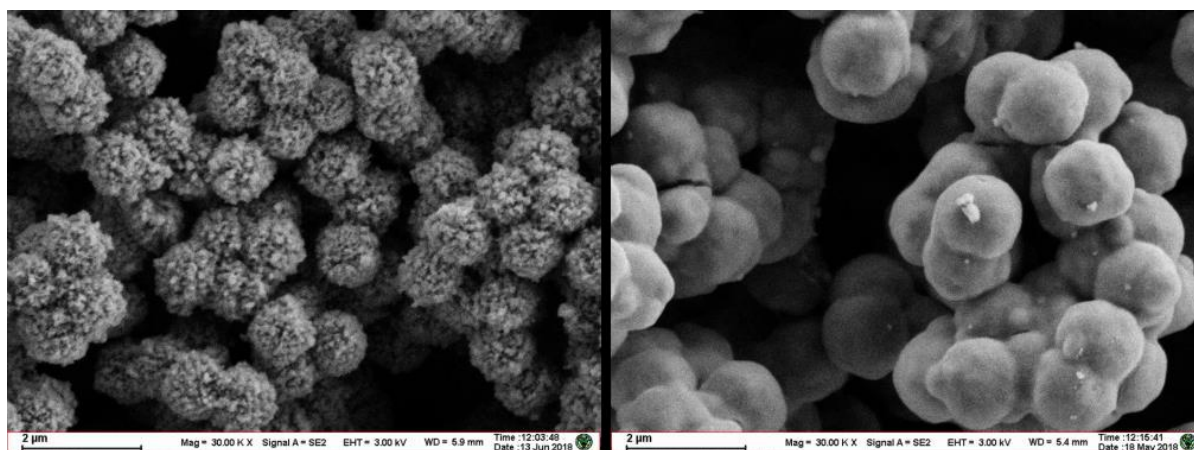


Figure 1: Scanning Electron Microscopy Images of Titanium Dioxide Magnetic Beads

2. Hydrodynamic Size by Dynamic Light Scattering (DLS)

The DLS hydrodynamic size of the 1 μm Titanium Dioxide Magnetic Beads (Thin Shell) is 1058 nm, with a polydispersity index (PDI) of 0.348 (top); The DLS hydrodynamic size of the 1 μm Titanium Dioxide Magnetic Beads (Thick Shell) is 1185 nm, with a polydispersity index (PDI) of 0.373 (bottom).

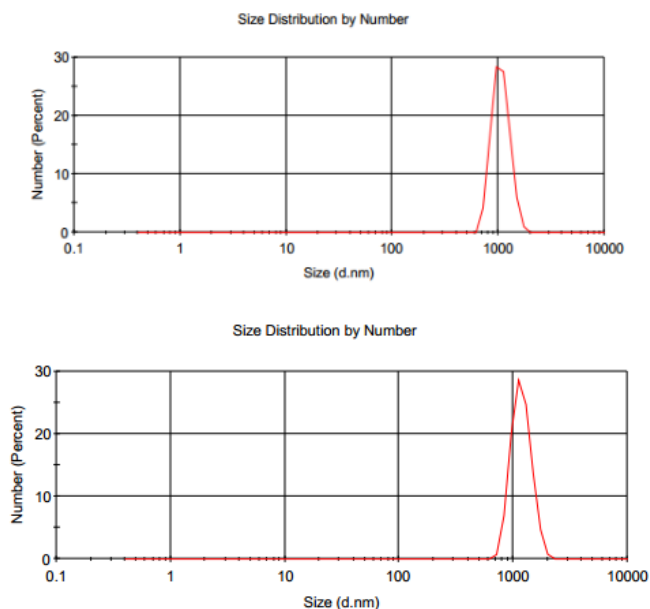


Figure 2: DLS Hydrodynamic Size Distribution Plots of 1 µm Titanium Dioxide Magnetic Beads

3. Surface Charge Zeta Potential Characterization

The Zeta potential of Titanium Dioxide Magnetic Beads (Thin Shell) is -35.0 mV (top); The Zeta potential of Titanium Dioxide Magnetic Beads (Thick Shell) is -35.7 mV (bottom).

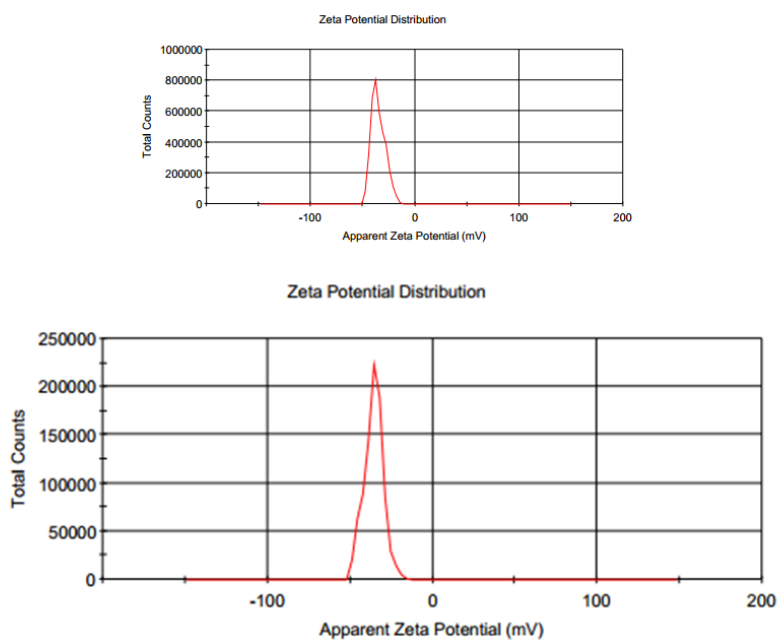


Figure 3: Surface Zeta Potential Plots of 1 µm Titanium Dioxide Magnetic Beads

Product Features

- High specificity for phosphopeptides and exosomes;
- No significant preference for monophosphorylated versus multiphosphorylated peptides;
- Fast magnetic responsiveness in less than 30 seconds, reducing sample loss and more suitable for automation;
- Antioxidant properties, reducing the risk of sample contamination.

Exosome Extraction

- Loading Buffer: 10 mM PBS (pH=7.4)
- Elution Buffer: PBS solution containing 10% ammonia water (10 mM PBS adjusted to pH 11.1 with 25% ammonia water, with a final ammonia concentration of 10% in PBS)

TiO₂ magnetic beads are stored in pure water at a concentration of 25 mg/mL. The beads should be washed and equilibrated (allowed to reach room temperature) before use. The amount of beads can be scaled up or down according to actual needs.

1. Vortex mix the TiO₂ magnetic beads to ensure uniform dispersion.
2. Transfer 200 μ L (5 mg) of TiO₂ magnetic beads to a 2 mL centrifuge tube.
3. Place the centrifuge tube on a magnetic separator for 30 seconds, then discard the supernatant.
4. Gently wash the microparticles with 200 μ L of 10 mM PBS (e.g., by intermittent vortex mixing) for 5 minutes.
5. Place the centrifuge tube on the magnetic separator for 30 seconds, then discard the supernatant.
6. Repeat steps 4 and 5.
7. Add 100 μ L of the sample (serum containing exosomes) to the beads and incubate together at 4°C for 5-10 minutes.
8. Place the centrifuge tube on the magnetic separator for 30 seconds, magnetically separate and remove the supernatant, then wash 2-3 times with 10 mM PBS (pH=7.4).
9. Remove from the magnetic field, add PBS solution containing 10% ammonia water to the bead-exosome complex, and incubate together at 4°C for 5-10 minutes to release the exosomes from the beads.
10. Place the centrifuge tube on the magnetic separator for 30 seconds, collect the supernatant exosome suspension. The pH of the exosome resuspension solution can be further adjusted by ultrafiltration. Note: Ammonia water is corrosive. Please refer to the safety instructions for operation. h23 i i h 10 M PBS (H 7 4).

Precautions

- Titanium dioxide magnetic beads will settle upon prolonged storage. Please mix thoroughly by stirring or vortexing before use.
- Keep sealed and store in the refrigerator at 2°C-8°C, avoid drying into a solid mass.

Specifications

Property	Value
Synonyms	Titania Magnetic Beads
Specifications & Purity	BioReagent, 25 mg/mL in H ₂ O
Stability And Storage	Store at 2-8°C long term (36 months). Desiccated. Do not freeze.
Storage Conditions	Store at 2-8°C, Desiccated, Do not freeze
Shipped In	Wet ice, Do not freeze This product requires cold chain shipping. Ground and other economy services are not available.

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- This product is not a CE-marked in vitro diagnostic device under IVDR (EU) 2017/746 and is not an FDA-cleared device under 21 CFR. Use is restricted to verified businesses, institutions, and qualified professionals for research and development purposes.
- Where any kit component is classified as hazardous under CLP (EC) 1272/2008 or OSHA HCS (29 CFR 1910.1200), the product Safety Data Sheet (SDS) takes precedence over this document for handling, storage, and disposal information.

- Performance depends on sample type, sample condition, handling, and operator technique. Users are responsible for validating the kit for their specific application.
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