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# A magnetic hydrazine-functionalized dendrimer embedded with $TiO_2$ as a novel affinity probe for the selective enrichment of low-abundance phosphopeptides from biological samples

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Abstract

Dendrimers exhibit tunable terminal functionality and bio-friendly nature, making them of being promising materials for applications in the field of separation and enrichment. In this work, we prepared magnetic hydrazide-functionalized poly-amidoamine (PAMAM) dendrimer embedded with $TiO_2$ for the enrichment of phosphopeptides. The novel affinity probe possessed superparamagnetism, realizing its rapid separation from sample solution. Electrostatic attraction and hydrogen bonding existed between PAMAM and phosphopeptides while Lewis acid-base interaction was originated between $TiO_2$ and the targets. The combined synergistic strength of multiple binding interactions contributed to the highly selective enrichment of phosphopeptides. The specificity for the capture of phosphopeptides was reflected in quantities as low as 1:1000 mass ratio of phosphopeptides to non-phosphopeptides. The detection limit of $\beta$-casein digests was low to 0.4 fmol, indicating the high sensitivity of the developed method. Fifteen and four phosphopeptides could be selectively captured from non-fat milk digests and human serum samples, which further confirmed the great potential of the affinity probe in the extraction of low-abundance phosphopeptides from real complex biological samples.



Graphical Abstract