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Title: Amorphous TiO2 Nanotubes as a Platform for Highly Selective Phosphopeptide Enrichment

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Abstract: This work reports highly selective phosphopeptide enrichment using amorphous TiO2 nanotubes (TiO2NTs) and the same material decorated with superparamagnetic Fe3O4 nanoparticles (TiO2NTs@Fe(3)O(4)NPs). TiO2NTs and TiO2NTs@Fe(3)O(4)NPs materials were applied for phosphopeptide enrichment both from a simple peptide mixture (tryptic digest of bovine serum albumin and alpha-casein) and from a complex peptide mixture (tryptic digest of Jurkat T cell lysate). The obtained enrichment efficiency and selectivity for phosphopeptides of TiO2NTs and TiO2NTs@ Fe(3)O(4)NPs were increased to 28.7 and 25.3%, respectively, as compared to those of the well-established TiO2 microspheres. The enrichment protocol was extended for a second elution step facilitating the identification of additional phosphopeptides. It further turned out that both types of amorphous TiO2 nanotubes provide qualitatively new physicochemical features that are clearly advantageous for highly selective phosphopeptide enrichment. This has been confirmed experimentally resulting in substantial reduction of non-phosphorylated peptides in the enriched samples. In addition, TiO2NTs@Fe(3)O(4)NPs combine high selectivity and ease of handling due to the superparamagnetic character of the material. The presented materials and performances are further promising for applications toward a whole range of other types of biomolecules to be treated in a similar fashion.

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