

Author's Accepted Manuscript

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PII: S0039-9140(18)30130-9
DOI: <https://doi.org/10.1016/j.talanta.2018.02.021>
Reference: TAL18340

To appear in: *Talanta*

Received date: 12 September 2017
Revised date: 29 January 2018
Accepted date: 6 February 2018

Cite this article as: Hongjun Xia, Shuangshou Wang and Lin Wang, Branched polyethyleneimine-assisted boronic acid-functionalized silica nanoparticles for the selective enrichment of trace glycoproteins, *Talanta*, <https://doi.org/10.1016/j.talanta.2018.02.021>

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Branched polyethyleneimine-assisted boronic acid-functionalized silica nanoparticles for the selective enrichment of trace glycoproteins

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Abstract

Boronate affinity materials have attracted more and more attention in extraction, separation and enrichment of glycoproteins due to the important roles that glycoproteins take on in recent years. However, conventional boronate affinity materials suffer from low binding affinity mainly because of the use of single boronic acids. This makes the extraction of glycoproteins of trace concentration become rather difficult or impossible. Here we present a novel boronate avidity material, polyethyleneimine (PEI)-assisted boronic acid-functionalized silica nanoparticles (SNPs). Branched PEI was applied as a scaffold to amplify the number of boronic acid moieties. While 3-carboxybenzoboroxole, exhibiting high affinity and excellent water solubility toward glycoproteins, was used as an affinity ligand. Due to the PEI-assisted synergistic multivalent binding, the boronate avidity SNPs exhibited strong binding strength toward glycoproteins with dissociation constants of 10^{-7} M, which was the highest among reported boronic acid-functionalized materials that can

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