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Biopolymeric nanoparticles in analytical sensing tools

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Biopolymer derivatized nanoparticles offer many advantages to be incorporated in various tools and technologies being developed by sensing fraternity. Chitosan, starch and many other biopolymers are suitable biopolymers as these natural polymers have excellent properties such as biocompatibility, biodegradability, non-toxicity and adsorption properties. Being environment friendly with such excellent characteristics prompted us to exploit it as polymeric format for developing molecularly imprinted polymers (MIP). Molecular imprinting offers creation of artificial receptor in a facile manner. MIPs often named as 'artificial enzymes' and/or 'artificial antibodies' are one of the most promising technique in sensor designing. The major benefits of MIPs compared with antibodies are their high and almost unlimited-stability and easy way of preparation at a large scale that unquestionably outperform antibodies in terms of costs. Nanoparticles of chitosan and starch with selective molecular recognition properties are attractive as they can easily be incorporated into existing analytical or preparative platforms to unravel various practical problems. An attempt is made in our laboratory to use biopolymer chitosan and starch as polymeric formats to imprint some analytes in nano-configuration. Chitosan, bearing primary amine groups, soluble in aqueous medium at acidic pH < 6.0, endowing them positive charge ($-NH_3^+$), can easily be attached with negatively charged surface or can adsorb negatively charged material, hence, commonly used for dispersing nanomaterials and immobilizing the target material for preparing sensing matrices. A simple, facile, cost-effective, sensitive and selective but still easy to fabricate sensors by molecular imprinting of biopolymer chitosan/starch in nanoformat are effective eco-friendly alternatives to other synthetic sensing matrices and they were able to detect analytes at trace level. Being simple, inexpensive, ecofriendly, rapid, high sensitivity and improved detection limit are promising for these tools.

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