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Nano-sized cyclodextrin-based molecularly imprinted polymer adsorbents for perfluorinated compounds

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Perfluorinated compounds (PFCs) such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) represent a class of persistent organic pollutants (POPs) that have been detected in drinking water, waste water effluents, soil and sediments, and other aquatic environments around the globe. Recent efforts have been directed towards the design of effective remediation technology for the removal of PFCs from the environment. While there is a general consensus on adsorption-based processes as the most suitable methodology for the removal of PFCs from aquatic environments, challenges exist regarding the optimal material design of sorbents for optimal uptake of PFCs. Cyclodextrin (CDs) have been shown to form well-defined host-guest complexes with PFCs in the solution phase and the solid state according to nuclear magnetic resonance (NMR), FT-Infrared, Raman, and differential scanning calorimetry (DSC), among other results. The materials design, sorbent characteristics, and uptake performance of CD-based molecularly imprinted polymers (CD-MIPs) are generally superior compared to conventional MIPs and non-imprinted polymers (NIPs). In general, MIPs offer the advantage of selectivity, chemical tunability, high stability and mechanical strength, ease of regeneration, and overall lower cost compared to NIPs. In particular, CD-MIPs offer the added advantage of possessing multiple binding sites with unique physicochemical properties such as tunable surface properties and morphologies that vary considerably. This report provides a rationale for the design of unique polymer adsorbent nanomaterials that employ an intrinsic porogen via incorporation of a macrocycle (e.g. CD) in the polymer framework to afford adsorbent materials with tunable physicochemical properties and improved sorption capacity.

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Study on the antifungal effect of silver nanoparticles synthesized by γ-irradiation on *Phytophthora capsici* causing the blight disease on pepper plant

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The colloidal silver nanoparticles (AgNPs) with particle sizes of 5, 10 and 15 nm using chitosan (1%) as a stabilizer were successfully prepared by irradiation method using gamma rays from a Co-60 source. The inhibition effect of silver nanoparticles products on *Phytophthora capsici* were increased by the decrease of the particle size and the increase of silver content in products. The results of *in vitro* antifungal activity by silver nanoparticles products on *P. capsici* pointed out that the treatments of the products with silver concentrations from 20 to 100 ppm inhibited the growth of *P. capsici* from 22.6 to 92.9%, respectively. The antifungal activity on *P. capsici* was increased from 62.5% to 100% by the decreasing size of silver nano particles in product from 15 to 5 nm. The results of *in vivo* tests on six months pepper plants also indicated that the treatment with 1-10 ppm AgNPs before infested with *P. capsici* reduced the ratio of diseased plants 40-82% compared to that of the control one. In addition, the treatment of the infested plants with 10-50 ppm AgNPs decreased the deseased plants in 42.7-77.3%, repectively. The silver nano particles stabilized in chitosan prepared by radiation technique may be used as an antimicrobial-product for peppers because of the hi-technology in production, high effect and safety for using.

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