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Research Article

Designing Zirconium Coated Polystyrene Colloids and Application

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Abstract

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Abstract

A simple technique has been developed to prepare core colloids that are modified using zirconium oxychloride, based on heating a solution of core colloid composites, consisting of poly (ethylenimine) (PEI) and zirconium oxychloride. The interaction of zirconium oxychloride with the polystyrene (PS) core colloids has been investigated using Fourier transform-infrared spectroscopy (FT-IR), energy dispersive X-ray spectroscopy (EDX), and scanning electron microscopy (SEM) data. FT-IR studies confirm the occurrence of amine groups present in PEI which are oxidized to carboxyl groups after the reaction. The EDX data and the SEM images confirm the presence of zirconium particles immobilized on the polystyrene surfaces. Demeton, a highly toxic nerve agent, was used due to its ability to easily bind through its organophosphate group illustrating a practical application of the PS-PEI-Zr particles. Attenuated Total Reflection (ATR) Spectroscopy was used to assess the interactions between the toxic nerve agent demeton-S and the PS-PEI-Zr particles. The results show that the presented technique for coating polystyrene core colloids with zirconium was successfully accomplished, and the newly formed particles easily bond with demeton agents through the P=O functional group.