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Full Paper

Direct Assembly of Mesoporous Silica Functionalized with Polypeptides for Efficient Dye Adsorption

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Abstract

Herein, we introduce a new polypeptide-functionalized mesoporous silica template fabricated from a biodegradable poly(ethylene oxide-*b*- ϵ -caprolactone) (PEO-*b*-PCL) diblock copolymer and a poly(tyrosine) (PTyr) biopolymer. The crystallization behavior of the PEO-*b*-PCL diblock copolymer changes after blending, but the secondary structure of PTyr remains stable. After selective solvent extraction in THF, the PEO-*b*-PCL is removed, but PTyr remains within the silica matrix due to its different solubility. Fourier-transform IR spectroscopic analysis (FTIR), thermal gravimetry analysis (TGA), small-angle X-ray scattering (SAXS), and X-ray diffraction (XRD) studies confirm the retention of PTyr to form a polypeptide-functionalized

mesoporous material. The adsorption of methylene blue hydrate (MB) from aqueous solution into the polypeptide-functionalized mesoporous silica is investigated, thus revealing that the nanocomposite exhibits a high adsorption capacity relative to pure silica due to hydrogen-bonding interactions between the hydroxy phenolic group of PTyr and the N-containing aromatic ring from MB.

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