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Enhancement of stability and reactivity of nanosized zero-valent iron with polyhydroxybutyrate

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ABSTRACT

Polyhydroxybutyrate (PHB) is a bacterial storage polyester, which is produced directly in the activated sludge process. In the present study, PHB was tested as a scaffold material for stabilization of nanosized zero-valent iron (nZVI). The morphology of the resulting composite was assessed using transmission electron microscopy (TEM) and scanning electron microscopy (SEM) coupled with energy-dispersive X-ray spectroscopy (EDX) analysis. In addition, the surface chemistry and particle stabilities of nZVI and nZVI/PHB were determined with zeta potential analysis and disc centrifuge measurements, respectively. Moreover, the sedimentation rate of bare nZVI was tested and compared with that for nZVI/PHB. Batch experiments further confirmed that nZVI/PHB particles are not only more stable but also more reactive toward perchloroethene (PCE) and Cr(VI) in comparison with the bare nZVI. These results suggest that PHB can be developed as an inexpensive and environmentally friendly material for the stabilization of nZVI particles.

Keywords: PHB; nZVI; Stabilization; VOC; Remediation; Cr(VI)

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