NANOSCALE ZERO VALENT PARTICLES - MODIFICATION APPROACH REFLECTED IN LONG-TERM AGGREGATION STABILITY AND ITS EVALUATION

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Abstract

Nanoscale zerovalent iron (NZVI) particles have been recently devoted the appropriate attention due to their ability to transform many environmentally unacceptable contaminants into benign products. [1] This fact predetermines the nanomaterial for a large scale application in the localities contaminated by various inorganic and organic pollutants. The efficiency of the NZVI impact is, however, strongly dependent not only on their concentration in the dispersion but also on their migration ability through a water-saturated porous media. These migration properties as well as the reactivity of NZVI particles are strongly influenced by the appropriate surface modification suppressing the aggregation tendencies of the particles. Therefore several surface modifiers of polymer character, either of natural or synthetic origin, have been more or less successfully applied.[2-7] Innovatively, we have introduced the environmentally acceptable surfactant, polyoxyethylene sorbitanmonooleate (Tween 80), and aqueous dispersion of sodium salt of poly(acrylic) acid. These modifiers were employed for the direct modification of the NZVI particles during the dispersion process. The effect of the direct mode modification was evaluated in contrast with the modification performed on the already existing dispersions of NZVI particles. The dispersion modified by Tween 80 was additionally involved in a large scale application, where the impact of the NZVI dispersion was monitored due to the decrease in the concentration of the polychlorinated hydrocarbons.

Keywords: zerovalent iron, nanoparticles, nZVI, surface modification, Tween 80, full-scale remediation, PCE removal, chlorinated ethenes

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