Zero valent iron nanoparticles for in-situ soil remediation

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The use of nanoscale zero valent iron particles (nZVI) for in-situ groundwater treatment and/or soil remediation is getting a lot of attention, due to the exceptional properties of these nanoparticles: nanoscale iron particles show higher surface area than microparticles, therefore nZVI show enhanced reactivity towards a wide range of contaminants, making it a promising technology in terms of sustainability and cost-effectiveness. However, high reactivity alone is not sufficient to make nZVI a good in situ remediation agent. Iron nanoparticles must also be readily dispersible in water such that they can migrate through water-saturated porous media to the contaminated area. Therefore, for the in situ remediation application colloidal stability of aqueous nZVI dispersion is a critical property.

In the present work, bare and biopolymer modified nZVI-based aqueous dispersions have been prepared by the standard borohydride method. By means of Transmission Electron Microscopy (TEM), Difraction X-ray (DRX) and Z-potential measurements, the nanometer size, chemical structure and morphology has been evaluated. In addition, the stability of the dispersions with time has also been determined. The objective is to establish a comparison in terms of the above mentioned properties with iron microparticles and with some commercial iron nanoparticles. Furthermore, the reactivity of these four particles (micro, nano (bare and modified) and commercial) towards trichloroethylene (TCE) has been assessed.

References:

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Figure:

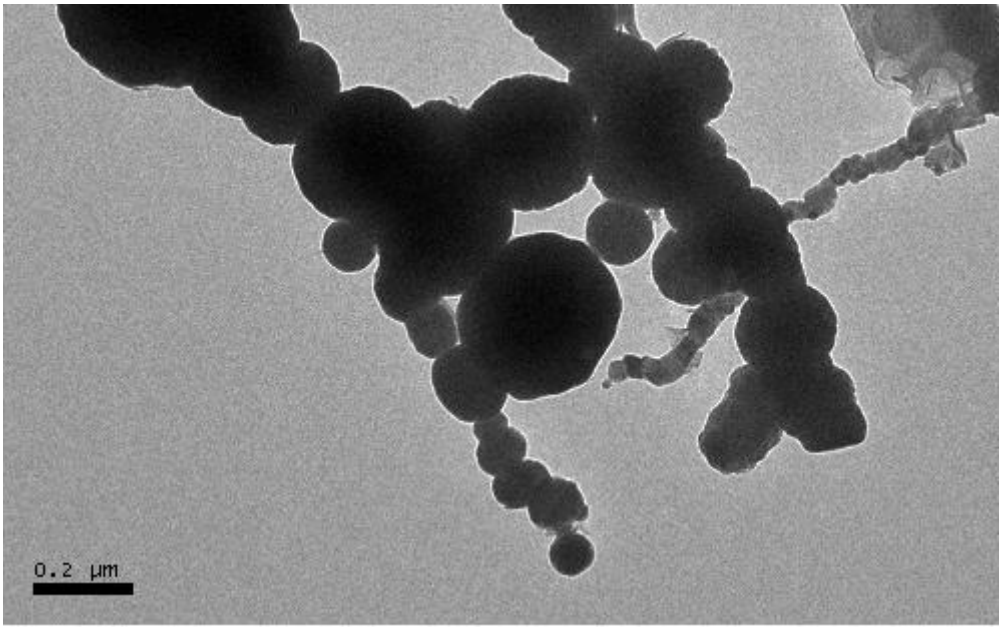

Figure 1. TEM image of bare nZVI particles.