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Fabrication of nano zero valent iron on kaolinite templates by a green pathway

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Nano zero valent iron (n-ZVI) is extensively used as a strong reductant for the environmental remediation of a wide array of organic and inorganic contaminants including nitrates. The major issues associated with nZVI are its hyper-reactivity and ready agglomeration resulting serious problems associated with storage and reactivity's yield to benign products. In this research we proposed synthesizing nZVI using green tea extracts onto kaolinite. The newly synthesized nZVI (hereafter GT-nZVI) is employed to chemically reduce nitrate found in water. Nitrate is a priority pollutant in Sri Lankan drinking water systems. Hitherto date most of the nZVI technologies are utilized for in situ remediation programs. In this research feasibilities will be sought to utilize GT-nZVI in community water treatment schemes. The other objective is to fabricate the GT-nZVI optimizing ammonia as a major product of nitrate reduction. The ammonia thus generated will be stripped off with free Cl_2 producing chloroamines that can be subsequently used as a safe disinfectant. In accordance with these aims we have synthesized air stable GT-nZVI on kaolinite templates. The Fe (II) ions retained on dispersed locations on kaolinite surface for formation of nZVI on edges by the reduction into metallic iron by green tea extracts. Further, the high concentrations of caffeine/ polyphenols present in solution play a dual role; as a reductant and as a capping material forming a protective shell around the nano particles. The GT-nZVI particles were characterized by spectroscopic and classical methods. The proton surface titrations confirmed a pH_{zpc} of the GT-nZVI was ~2.00 which dominates negatively charged surface sites.

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