Greenly Synthesised Iron Nano Particles and Their Application for Degradation of Volatile Organic Compounds

S. Ehanathan [1], K. Velauthamurty [2], R.M.G. Rajapakse [1], K. Raagulan [1]

[1]*Postgraduate institute of Science, University of Peradeniya, Sri Lanka*
[2]*Department of Chemistry, University of Jaffna, Sri Lanka*
Email: kvels@jfn.ac.lk

Abstract

Water pollution creates main issues due to the presence of organic pollutants such as benzene, Toluene, Ethylbenzene and xylene (BTEX), which has become an important global environmental demand. Currently, advanced oxidation shows a significant role in the degradation of BTEX in polluted water in the purification of waste water. However, most of the oxidation work use greenly synthesized iron nanoparticle (INP). We focus on a greenly synthesis of iron INP and degradation of BTEX in oil polluted water for the first time. INP is synthesized with green synthetic method using green tea as reducing and capping agent to keep particles in nanometer scale. The final INP and activated carbon composite are prepared by calcining at 500 ^{o}C for 1h. The synthesized nanoparticle is characterized by X-Ray diffraction and scanning electron microscope. The composite has been well formed with particle size ranges from 40 nm to 110 nm. The advanced oxidation activity of INP has been examined by the degradation of BTEX in an electrochemical cell. The reactivity of modified activated carbon was tested by the 100 ppb of BTEX standard solution in water. The oxidation of BTEX occurred in the presence of active oxygen and iron nanoparticles that imply the oxidation via the free radical pathway. Further, the oxidation of BTEX was fastest in the presence of 900 mA current through which iron nanoparticles cause vanishing of 90% of BTEX within 30 min. Oxidation of BTEX in water polluted by waste oil is vanishing of 90% of BTEX within 70 min. These observations suggest that the potential of INP can be used as water purification materials, and environmental therapy to remove or convert harmful organic substances.

Keywords: Iron nano particle, BTEX degradation, Oil degradation