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SYNTHESIS OF ATMOSPHERIC STABLE ZERO VALENT IRON NANOPARTICLES ON RADIATION-INDUCED GRAFTED GRAPHENE OXIDE THIN FILMS

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Atmospherically stable zero valent iron nanoparticles (nZVI) were stabilized on radiation-induced polyacrylic acid grafted graphene oxide thin films. Graphene oxide thin films were synthesized by a modified Hummers method using a rare form of graphite. Polyacrylic acid was grafted on to the surface of the graphene oxide thin films by exposing to Co-60 γ radiation. nZVI were synthesized by reducing Fe (III) in $FeCl_3$ by $NaBH_4$ and stabilized by adsorbing on to the polyacrylic acid grafted graphene oxide thin films. The stabilized nZVI adsorbed graphene oxide thin films were characterized by Fourier transform infrared – attenuated total reflectance (FTIR-ATR) spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersive X-ray (EDX) analysis. The SEM images revealed that polyacrylic acid was grafted properly on to the surface of graphene oxide during irradiation and that nZVI were well dispersed on the surface of the polyacrylic acid grafted graphene oxide thin films. EDX analysis confirmed the presence of nZVI on the surface of polyacrylic acid grafted graphene oxide thin films. Supplementary evidence for proper grafting of polyacrylic acid was shown by the XRD and FTIR-ATR analysis. Furthermore, FTIR-ATR analysis showed that nZVI were adsorbed on to the carboxylate groups in polyacrylic acid with a monodentate configuration. Therefore, it could be concluded that synthesized nZVI by this method was stable under ambient conditions.

Keywords: Graphene oxide, Nano zero valent iron, Polyacrylic acid, Radiation grafting.