Characteristics of Iron Oxide Rust Prepared by Peracetic Acid and Its Removal of Heavy Metals in Water

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Iron oxide is especially promising as they show high heavy metal adsorption capacity. However, the high cost of iron oxide makes it difficult to be widely used in developing countries. Therefore, there is currently a growing demand for appropriate technology for heavy metal removal. Herein, we probe the heavy metal removal performance of iron oxide rust. Rust was grown on iron nails in a controlled manner using Peracetic acid (CH_3CO_3H), a safe and environment-friendly oxidizer. Arsenic and cadmium was selected as an example of a contaminant in this study. The iron oxide layer completely covered the surface of the nail after two hours of oxidation. From the XRD and EDS analysis, the iron oxide prepared with peracetic acid was nearly amorphous Fe_2O_3. Amorphous iron oxide is reported to show higher reactivity than crystalline iron oxide. The BET specific surface area of prepared Fe_2O_3 is 71 m^2/g, which is larger than that of a commercial Fe_2O_3. Oxidized nails are highly effective for removing heavy metals: about 90% of 1ppm arsenic and 82% cadmium in water was removed at the residence time of 20 minutes, Rust of one square centimeter area made with peracetic acid can remove up to 0.11 mg of arsenic and 0.043 mg of cadmium.

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