THE EFFECT ON ACTIVATING THE ZERO-VALENT IRON (FE$^0$) BY ADDING ACID AND USING ULTRASONIC

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Abstract: Contaminated soils pose potentially serious threats to surface and ground water quality, especially when concentrations are high due to spills, discharges, or leaking storage tanks. One possible remediation option is in-situ reductive reaction by zero-valent iron (Fe(0)), either by direct injection or as reactive barriers. The reduction on contaminants induces the oxidation on the surface of zero-valent iron particles. Fe$_2$O$_3$ and Fe$_3$O$_4$ will mantle the zero-valent iron particles during this reaction. Fe$_2$O$_3$ and Fe$_3$O$_4$ will keep the zero-valent iron particles from react with contaminants. If there are two layers of oxide on an iron particle with 1μm diameter, only 0.23% zero-valent iron is used in a remediation process. In other word, 99.77% of iron atoms do not participate in the react with contaminants. How to prevent the formation of oxidized layer is an important work. Some articles showed that H$^+$ is helpful in destroying the oxidized layer. In this study, the ultrasonic and H$_2$SO$_4$ were used to destroy the layers of oxide or prevent the formation of oxidized layer on the iron particles. Hence, this study used the commercial iron powder (10μm) of different mass and controlled the experimental environment in different pH. The results showed that the ultrasonic combined with H$^+$ were helpful during the experimental procedure. The concentration of target chemical (NO$_3^-$) is reduced evidently.

Keyword: Oxidized layer, zero-valent iron, H$^+$, ultrasonic