ADSORPTIVE REMOVAL OF FERROUS ION FROM AQUEOUS SOLUTION USING NATURAL FERRIHYDRITE

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ABSTRACT

Total iron in water is one of major aesthetic problems due to its unpleasant taste, smell and rusty appearance. Iron mainly occurs as ferrous Fe (II) or ferric Fe (III). Fe (II) is soluble and Fe (III) is insoluble and occurs as colloids, in this work we consider all irons in solution phase. Aeration, ion exchanging and adsorption methods are the widely used to remove iron. The adsorption process has many advantages such as low cost of adsorbent, utilization of industrial, biological and domestic waste as adsorbents, low operational cost, ease of operation compared to other processes, capacity of removing heavy metal ions over wide range of pH and to a much lower level, environmentally friendly and cost effective. In this research ferrihydrite is used as a starting material to remove excess iron in potable waters. This method has several advantages; the material is readily available, and can be generated in their presence of excess iron in solution and it is environmentally benign. The major process we are interested is the sorption. Ferrihydrite ($Fe_5HO_8 \cdot 4H_2O$), a poorly crystalline meta stable mineral which is a precursor to the more stable iron oxides such as goethite and hematite. It is commonly formed by rapid oxidation of Fe (II) containing solutions followed by hydrolysis in the presence of crystallization inhibitors (Schwertmann, 1982). One of the most significant roles of ferrihydrite is as an adsorbent for various trace elements due to its coordination-unsaturated surface sites, large surface area, strong adsorptive effects, and high adsorption capacity.

In this study, a series of batch laboratory experiments were conducted in order to investigate the feasibility of natural ferrihydrite for the removal of iron, Fe (II) from aqueous solution by the adsorption process. Investigation was carried out by studying the influence of initial solution pH, contact time, adsorbent dosage and initial concentration of iron. All batch experiments were carried out at a constant temperature of 25°C using magnetic stirrer that operated at 120 rpm. The findings indicate that the possibility of applying natural ferrihydrite as an adsorbent to remove ferrous ion with the approximate removal percentage of 99%.

Key Words: Iron Removal, Ferrihydrite, Batch adsorption, Adsorption isotherms