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A Review on Studies and Research on Iron Removal

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ABSTRACT

Removal of various metals is one of the important and widely investigated areas of research. The presence of iron in water imparts reddish colour and undesirable odour. It is difficult to removal iron complexed with other organic and inorganic compounds. It has high solubility in aqueous substances. Common methods used for iron removal includes chemical precipitation, coagulation-flocculation, flotation, ultrafiltration, nanofiltration, reverse osmosis, electrochemical treatment techniques like electro dialysis, membrane electrolysis, electrochemical precipitation, electroextraction. The current review summarizes research and studies on iron removal.

Key words: microfiltration, optimum dose, pH, nanoparticles, concentration.

INTRODUCTION

Wastewater treatment for removal of various organic and inorganic compounds is rapidly evolving field. The industrialization has led to research on new and efficient technologies. These technologies include cost effective solution for wastewater treatment. Wastewater treatment for removal of chemical oxygen demand is most widely studied area in wastewater engineering. [1-5] The organic pollutants and heavy metals affect adversely man and environment. [6-8] Their removal can be carried out by biological methods like activated sludge methods and trickling filters. [9-13] Adsorption is most widely used methods practically and in research also. [14-16] The presence of iron in water imparts reddish colour and undesirable odour. It is difficult to removal iron complexed with other organic and inorganic compounds. It has high solubility in aqueous substances. Common methods used for iron removal includes chemical precipitation, coagulation-flocculation, flotation, ultrafiltration, nanofiltration, reverse osmosis, electrochemical treatment techniques like electrodialysis, membrane electrolysis, electrochemical precipitation, electroextraction. The current review summarizes research and studies on iron removal.

RESEARCH AND STUDIES ON IRON REMOVAL

Bulai and Cioanca investigated chelating resin purolite S930 for removal of iron from wastewater. [17] They used sulphate of iron for the preparation of synthetic effluent. With pH the equilibrium iron concentration decreased. The optimum pH for iron removal was observed to be 5. With increase in initial iron concentration the percentage removal decreased. For increase in concentration upto 100 mg/l, loading capacity increased sharply, showing insignificant change thereafter. Ankrah and Søgaard carried out review on biological removal of iron. [18] The biological reaction in presence bacteria and water forms hydroxide. Albrektiene et. al. used coagulation for removal of iron- organic complexes from wastewater. [19] They discussed the possibilities of removal of iron-organic complexes using the coagulant poly-aluminium chloride (PAC). They carried out experimentation on concentration of total iron, permanganate index, pH and residual aluminium. In their work, they established the conditions under which the process of coagulation is most effective. The pH value of 6.5-6.8 favoured the iron removal.

Barlokova and Ilavsky investigated use of natural materials for filtration for iron removal. [20] They used chemically activated natural zeolite (Klinopur-Mn) produced in Slovakia with imported Birm for iron removal from wastewater. They found the iron removal was influenced by water and filter material (height of filtration layer, filtration time), properties of preparation active layer, i.e. layer thickness and its chemical composition, regeneration technology. Win et.al. used water hyacinth for Iron removal from industrial waters. [21] They carried out preliminary study aimed at treating industrial waters that are contaminated with iron. In their investigation, high iron accumulation was observed at lower concentration of 0.001 M, in roots and leaves. They observed three types of stresses namely uptake, excretion and oscillation.

Modified coconut shell charcoal was used as adsorbent by Beenakumari for iron removal from water. [22] She observed that iron removal resulted from adsorption of oxygen followed oxidation of iron. She observed that iron removal increased with decrease in particle size. The optimum concentration was observed to be 500 ppm. Teunissen et. al. carried out an investigation on removal of iron from ground water. [23] Settling of iron (hydroxide) particles or post-treatment flocculation of dissolved iron according to them was one of the major reasons for iron contamination of water. They carried out the study towards the current iron removal processes and also investigated removal of dissolved and particulate iron. The elementary work carried out by them indicated that operational events such as switching on/off of filters and back washing have a significant impact. It was possible to improve iron removal by using caustic soda dosage or crushed limestone filtration. Hiiob and Karro carried out studies on removal of iron from water treatment plants. [24] They carried out studies on the effectiveness of 20 groundwater purification plants with eight different water treatment systems. Baruah et. al. carried out investigation on iron removal efficiency of charcoal derived from bamboo. [25] They carried out an investigation on iron removal by using four different bamboo charcoals Bambusa balcooa, Bambusa nutans, Bambusa tulda and Bambusa Padilla separately for iron removal. pH value greater than 7.5 favoured the iron removal. They found that though all four charcoals were efficient for iron removal, Bambusa balcooa was more capable of bringing iron levels decreases to desirable limits.

CONCLUSION

It was observed by investigators that, in ion exchange studies, with pH the equilibrium iron concentration decreased. Also the optimum pH for iron removal was observed to be 5. For coagulation, as found by researchers, using poly aluminium chloride, the pH value of 6.5-6.8 favoured the iron removal. Research on zeolite application for iron removal indicated that the factors like height of filtration layer, filtration time, properties of preparation active layer, i.e. layer thickness and its chemical composition, regeneration technology.

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