An Experimental Study for Enhancing the Autocatalytic Effect of Precipitated Iron in Gas-Liquid Reactor on the Oxidation of Ferrous Iron

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Iron-containing groundwater is still crucial impact on daily water consumption, as higher level than 0.3mg/L of iron can stain the surface and clothes. Oxidation followed by filtration is a relatively conventional process for iron remediation. Iron must firstly be oxidized to generate an insoluble form, which is then filtrated out. The traditional technique of iron oxidation, aeration is the process of allowing oxygen or air (rich in oxygen) to make contact with the water system. Consequently, aeration is a viable option for removing iron from water with a concentration greater than 5 mg/L; and is unquestionably cost-effective due to the absence of additional chemicals. Even aeration process has a potential application for iron reduction from domestic iron containing-groundwater, comparision of influent process condition on kinetic study of iron oxidation is up to date. This present study aims to study the ferrous iron oxidation kinetic under batch condition through optimizing the operation condition towards improving the autocatalytic effect of precipitated iron on ferrous iron oxidaiton. Experiements were conducted in beaker for containing 2 litters total working volume, and investigated in room temperature. Compressed air pump were connected to rigid stone air sparger. The influence of process conditions, i.e., initial pH, constant pH (between 6.5-7.5), gas flow rate (between 0.5-3 L/min), initial ferrous iron concentration (2-20 mg/L), and insoluble ferric hydroxide (α-FeOOH) (0-50 mg/L) were investigated. According to the results, it indicated that oxidation performance increased with increasing of initial pH. Thus, pH has pronounced a main significantly effect on ferrous oxidation. For controllable pH constancy, oxidation rate is found to be much faster when its initial concentration increased for both reactors. However, oxidation rate is decelerated with higher initial concentration of ferrous iron due to acidity production of ferrous/ferric iron oxidation reaction within non-controllable system. Morover, iron oxidation by aeration mostly produced γ-lepidocrite as effective cataylst for oxygenation, even so, additional of geothite (α-FeOOH) may also showed the increasing oxidation rate with proportionally elevated with its concentration in this study. Additionally, supplied gas flow rate also revealed the influence on ferrous iron oxidation performance due to supplied to an aeration system when it was provided in low condition. However, it does not influent if excess amount of oxygen was provided or oxygen concentration reached the saturation.