Study on Removal of Chelated-metals in Aqueous Solutions by Electro-aggregation Process

陳胤瑋、申永順

E-mail: 9607865@mail.dyu.edu.tw

ABSTRACT

The reaction behaviors of the removal of single and multiple component of chelated metals wastewaters by Electro-aggregation process were studied. The experiments were carried out under various the initial concentrations, molar ratios, and types of chelated metals (metals: Ni2+, Cu2+, Zn2+; chelated agents: EDTA, NTA, or citric acid), solution pH values, current densities, electrode numbers, and types of electrode to investigate these operational factors on the treatment efficiencies and removal behaviors of pollutants. The treatment experiments by electro-aggregation and electrochemical Fenton processes were conducted within an internally circulating batch reactor to explore the role of H2O2 on the removal of chelated metals within the eletro-coagulation systems. In the study, two possible removal models for discussing possible reaction mechanisms of chelated metals: (1) removal by direct coagulation via molecular form of chelated metals, (2) the chemical bonds of chelated metals are broken first, then the free metal ions are coagulated by hydrogen oxides and coagulatants (i.e. Fe(OH)3). Based on the findings and investigation, the contribution of each removal mechanism of chelated metals can be differentiated rationally. The second removal model of chelated metals mentioned above was determined to be the dominate reaction pathway occurred by the electro-aggregation and electrochemical Fenton processes. In the single component of metals wastewaters, the removal rate sequence of metals by electro-aggregation process was found to be Zn2+＞Cu2+＞Ni2+. After chelating with chelating agents, the removal rate of Zn2+ and Cu2+ decreased, and those of Ni2+ increased. For multiple components of chelated metals wastewaters by electro-aggregation process, removal rate sequence of metals was found to be Cu 2+＞Zn 2+＞Ni2+. The chelating agents in aqueous solutions can not effectively remove by electro-aggregation process, but the removal rates would be raised apparently after chelating by metals. The removal rates of chelated-Cu2+ and COD within experiments by electrochemical Fenton process which means the system of electro-aggregation process with addding H2O2 were found to be less than those by electro-aggregation, but those of chelated-Ni2+ were found to be raising.

Keywords : electro-aggregation processelectro-aggregation ; Fenton process ; current density

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