Indium Recovery in an Electrochemical Flow Reactor. Simulation and Experiment

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This study investigated the numerical simulation and experiment of a continuous indium removal process from wastewater by using an electrochemical flow reactor. The competition between hydrogen evolution and indium reduction was taken into consideration. The simulated residual indium distribution accompanying with flow field corresponds to the removal performance of experiments. The concentration field indicates a two-stage development between the electrodes. In the second stage, an apparent removal of indium takes place, but a steady state reached after a long-term incubation at a low flow rate. However, the removal ratio rises quickly and levels off after a short-term incubation at a high flow rate. At 762 mL/min, 90% or more of indium in wastewater can be removed, but only 50% or less of indium can be reduced at 7620 mL/min. The flow cell takes a compromise between throughput and efficiency if an optimal operation is adopted. The optimization on the basis of energy consumption and equipment cost shows that two flow cells in series operated at 3810 mL/min may be more economical than a unit cell at any flow rate in the influence of hydrogen evolution.

Keywords: Numerical simulation; Electrochemical Flow Reactor; Indium; Wastewater.

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