Chemical Engineering Thesis Defense

Silver Recovery through a Fluoride Chemistry for Solar Module Recycling

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Abstract

With the demand growing for more sustainable forms of energy in replacement of fossil fuels, a major obstacle arises in the end-of life solar modules that are disposed of in landfills. Aside from the hazardous materials, silicon solar modules contain valuable and scarce materials such as silver. Silver is used in many industries and many applications therefore the recycling and recovering of it is financially beneficial. The purpose of this research was to achieve high purity and recovery of silver using hydrofluoric acid.

The following work presents the feasibility of silver recovery through the process of leaching and electrowinning by examining the percent recovery and cathodic coulombic efficiency, followed by a chemical analysis to determine the purity. Varying conditions in leaching and electrowinning parameters are conducted in a synthetic solution to determine the effect on silver recovery and cathodic coulombic efficiency. It was determined that the silver recovery was dependent on the applied potential, system configuration and time. The system is capable of recovery rates of over 95% at -1 V. The system is further tested on solar cells to prove that silver can be recovered. There was over 99% purity from the experiments conducted in synthetic solution and from solar cells. Additionally, a circular chemistry is proposed that allows the reuse of hydrofluoric acid for leaching and electrowinning.

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