Silver Recovery from End-of-Life Photovoltaic Panels: Pretreatment with Sulfuric Acid and Leaching via Hydro-PV Process

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The recovery of precious metals such as silver from end-of-life products has become a fundamental factor in the sustainable development of many countries. This not only supports environmental goals but is also a profitable economic activity. The present work deals with pretreatment and leaching of two powdered samples from end-of-life photovoltaic panels, which contain approximately 1.3 and 0.94 wt.% silver, and 12.5 and 0.44 wt.% copper, respectively. Due to the fact that high amounts of copper can decrease the yield of silver leaching and the concentration of copper in the first sample was high, pretreatment was necessary to reduce the copper concentration. For this purpose, the sample was leached with 1.8 mol/L sulfuric acid and 20 v/v% H_2O_2 with 10% solid-to-liquid ratio at 200 rpm for 60 minutes at room temperature. Results showed that this procedure for pretreatment of the samples was effective and copper concentration decreased from 12.5 to 0.25 wt.% while silver concentration increased from 1.3 to 1.6 wt.%. After pretreatment, leaching tests were conducted using Hydro-PV process with 20 g/L Thiourea, 6 g/L Fe^{3+}, and 0.2 mol/L Sulfuric acid with a 10% solid-to-liquid ratio at 300 rpm in room temperature. At this stage in order to study the effect of leaching time on the dissolution of silver, ten tests were conducted at time intervals ranging from 5 to 180 minutes. The results illustrated that the silver dissolution was nearly completed within 2 hours. The obtained results from pretreatment and leaching process can provide fundamental data for developing the silver recovery process from end-of-life photovoltaic panel recycling in an industrial scale.

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