

5th Global Summit and Expo on Pollution Control

October 25-27, 2018 | Prague, Czech Republic

Recovery of copper from spent copper etching solution using wasted aluminum drill entry sheets from PCBs industry

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The study aimed to use wasted Al drill entry plates combined with NaCl as catalyst in cementation process for reclamation of Cu from spent etching solution from PCBs industry. Initial pH of etchant was 0.35 with total Cu concentration of 18,930 mg/L (98 % presented in soluble form). Optimizations for the amount of Al sheets (0-11 g L⁻¹) and NaCl (0-50 g L⁻¹) as well as the order of applying were examined. Settling parameters of the produced flocs, including crystalline morphologies, components, semi-quantitative elemental results and copper content from the obtained dry sludge were evaluated. Results indicated that Cu recovery performances were significantly affected by the order of chemical adding. First applying optimized 10 g L⁻¹ Al plates followed by 20 g L⁻¹ NaCl, resulted in almost 100 % of Cu removal efficiency. In contrast to the case of applying NaCl prior Al plates filling under similar fixed given amount, remained Cu concentrations in spent etchant were found up to 1,170 mg L⁻¹ corresponding to the lower Cu removal efficiency in comparison to the former case. For most effective conditions, the blue Cu solutions were observed instantaneously changed to be colorless after cementation process. Dense obtained sludge with 0.15 cm s⁻¹ settling velocity and SVI of 6.8 mL g⁻¹ was formed. SEM-EDS results for the reddish brown sludge showed that Cu was the majority element and the remainders were Pb, Al, Sn, O, S and Cl. Cu fraction in dried solid sludge was 85.8% (w/w) which metallic copper (Cu) and cuprite (Cu₂O) were mainly detected.

Biography

Dr Nanthanat Sriprasert is a lecturer in Faculty of Environment and Resource Studies at Mahasarakham University, Thailand. Her research has currently focused on pollution control and environmental sustainability, especially, the process of utilizing industrial and agricultural waste/wastewater into useful products by recycling. She has her expertise in waste recycling and waste management, particularly, technologies of base and precious metals recovery from E-waste and PCBs manufacturing wastewater. She has built valuable results after years of experience in these researches. Dr Sriprasert, the corresponding author, obtained a BEng and MEng in Environmental Engineering from Suranaree University of Technology, Thailand. She was awarded her PhD by the University of Southampton, The UK.

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