

**PUNGUT ULANG PERAK DARI LIMBAH ELEKTRONIK BATERAI KOIN
PERAK OKSIDA MENGGUNAKAN PELARUT *DEEP EUTECTIC* OKSALIN**

SKRIPSI

diajukan untuk memenuhi sebagian dari syarat memperoleh gelar Sarjana Sains pada Fakultas
Pendidikan Matematika dan Ilmu Pengetahuan Alam



oleh

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ABSTRAK

Perak merupakan logam yang memiliki konduktivitas listrik, konduktivitas termal, dan reflektivitas tertinggi di antara semua logam dan pada tahun 2021 permintaan perak dunia mencapai 32,627 ton. Untuk memenuhi permintaan perak dunia selain menambang dari alam, perak juga bisa didapatkan melalui pungut ulang dari limbah elektronik menggunakan *Deep Eutectic Solvent (DES)* yang ramah lingkungan. Penelitian ini bertujuan untuk melakukan pungut ulang logam perak dari limbah elektronik baterai koin perak oksida menggunakan metode pelindian dengan DES oksalin. Metodologi penelitian terdiri dari tahapan sintesis pelarut eutektik oksalin, karakterisasi, dan aplikasinya pada pelindian perak dari katoda baterai perak oksida. Pelindian perak dilakukan dengan melarutkan 0,2 gram sampel dengan pelarut oksalin 1:1 dengan pemanasan langsung selama 3×8 jam pada pengadukan 500 rpm. Variasi suhu pelindian yang dilakukan adalah 50, 60, 70, dan 80 °C dan variasi volume DES oksalin yang digunakan adalah 20, 40, 60, 80, 100, dan 125 mL/g. Konsentrasi perak hasil pelindian diukur menggunakan instrumentasi AAS. Hasil sintesis dikarakterisasi dengan FTIR menunjukkan terbentuknya interaksi antarmolekul yang baru yaitu interaksi $\text{COOH} \cdots \text{Cl}$. DES oksalin memiliki densitas sekitar 1,2095 g/mL. Berdasarkan hasil optimasi suhu pelindian dengan menggunakan 20 mL/g pelarut didapatkan suhu optimum untuk melakukan pelindian adalah pada suhu 60 °C dengan efisiensi pelindian sebesar 88,35%. Sedangkan hasil optimasi volume pelarut yang dilakukan pada suhu optimum didapatkan bahwa volume optimum pelarut yang digunakan adalah 80 mL/g sampel dengan efisiensi pelindian sebesar 94,23%. Berdasarkan hasil tersebut terlihat bahwa oksalin berpotensi untuk digunakan sebagai pelarut pada pengolahan limbah baterai bekas perak oksida.

Kata kunci: *Perak, Oksalin, limbah baterai perak oksida, pungut ulang, pelindian.*

ABSTRACT

Silver is a metal that has the highest electrical conductivity, thermal conductivity and reflectivity among all metals and by 2021 the world's silver demand will reach 32,627 tons. To meet the world's silver demand, apart from mining from nature, silver can also be obtained through re-collection of electronic waste using environmentally friendly Deep Eutectic Solvent (DES). The aim of this study was to recover metallic silver from electronic waste of silver oxide coin batteries using oxalin DES leaching method. The research methodology consisted of the steps of synthesizing the eutectic solvent oxalin, characterizing it, and its application to the leaching of silver from the cathode of a silver oxide battery. Silver leaching was carried out by dissolving 0.2 grams of sample with 1:1 oxaline solvent by direct heating for 3×8 hours at 500 rpm. The leaching temperature variations were 50, 60, 70, and 80 °C and the volume variations of the DES oxalin used were 20, 40, 60, 80, 100, and 125 mL/g. The concentration of leached silver was measured using AAS instrumentation. The results of the synthesis were characterized by FTIR indicating the formation of a new intermolecular interaction, namely the COOH•••Cl interaction. DES oxalin has a density of about 1.2095 g/mL. Based on the results of the optimization of the leaching temperature using 20 mL/g of solvent, the optimum temperature for leaching was found at 60 °C with a leaching efficiency of 88.35%. While the results of the volume optimization of the solvent carried out at the optimum temperature, it was found that the optimum volume of the solvent used was 80 mL/g of sample with a leaching efficiency of 94.23%. Based on these results, it can be seen that oxaline has the potential to be used as a solvent in the treatment of used silver oxide battery waste.

Keywords: *Silver, oxaline, silver oxide battery waste, recovery, leaching.*

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