Recovery tembaga dari limbah elektronik Printed Circuit Boards (PCB) berdasarkan cyclic voltammetry dalam tiga tipe Diluted Deep Eutectic Ssolvent (DDES) = Rrecovery of copper from electronic Waste Printed Circuit Boards (PCBs) based on cyclic voltammetry in three types of Diluted Deep Eeutectic Solvent (DDES).

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Abstrak

Recovery tembaga dari limbah elektronik printed circuit boards (PCB) berdasarkan cyclic voltammetry dalam tiga tipe diluted deep eutectic solvent (DDES) telah berhasil dilakukan. Penggunaan larutan diluted deep eutectic solvent (DDES) sebagai alternatif untuk penggunaan solvent yang murah, efisien dan aman terhadap lingkungan yang terbentuk dari ikatan donor (HBD) dan aceptor (HBA) dengan perbandingan 1 mol:2 mol terhadap air yangmenghasilkan campuran eutektik. Diluted deep eutectic solvent (DDES) yang digunakan, terdiri dari tiga tipe larutan diantaranya ChCl:Ethylen glykol (Ethalin), ChCl:Glycerol (Glalin) dan ChCl:thiourea (Reline). Hasil comminution pada limbah elektronik printed circuit boards (PCB) tipe multi-layer seberat 200 gr, menghasilkan 7 klasifikasi material logam dan non logam dengan fraksi berat seperti logam murni 44.68 gr, plastik murni 50.56, plastik campuran 1.32 gr, potongan papan murni 2.9 gr, potongan papan campuran 89.74 gr, keramik murni 3.52 gr dan, keramik campuran 7.28 gr. Hasil XRF (X-ray fluorescence spectrometry) pada printed circuit board (PCB) setelah comminution mendapatkan unsur tertinggi yaitu tembaga sebesar 17,91%, dan menjadi objek untuk pengamatan penelitian. Semua percobaan pada pengujian cyclic voltammetry menghasilkan voltammogram dengan tipe irreversible. Penambahan air lebih dari 50 % pada deep eutektik solvent (DES) mempengaruhi puncak dari oksidasi dan reduksi serta secara teori, efisiensi arus sebesar 99.83 % dan hasil optimum pengujian terjadi pada temperatur 60oC untuk pengujian larutan diluted deep eutektik solvent (DDES) tipe ChCl:Ethylen glykol (Ethaline) dengan potensial Ep = 5.3085 volt dan Ep/2 =5.3081 volt. Hasil analisa SEM-EDX pada plat platina (Pt) dari diluted deep eutectic solvent (DES) ChCl:Ethylen glykol (Ethalin) dan ChCl:thiourea (Reline) mampu untuk mendeposisi secara spontan pada mineral tembaga ke permukaan plat platina (Pt) Sedangkan larutan glaline tidak mampu untuk mendeposisi logam yang di harapkan.

.....Recovery of copper from electronic waste printed circuit boards (PCBs) based on cyclic voltammetry in three types of diluted deep eutectic solvent (DDES) has been successfully carried out. The use of a diluted deep eutectic solvent (DDES) solution as an alternative to the use of a solvent that is cheap and safe for the environment is formed from a donor (HBD) and an acceptor (HBA) with a ratio of 1 mol: 2 mol to water which produces a eutectic mixture. Diluted deep eutectic solvent (DDES) is used with three types of solutions including ChCl:Ethylene glycol (Ethalin), ChCl:Glycerol (Glycelin) and ChCl:thiourea (Reline). The results of comminution on printed circuit boards (PCB) multi-layer type with weight 200 gr, produced 7 classifications of metallic and nonmetallic materials with heavy fractions such as 44.68 gr pure metal, 50.56 gr pure plastic, 1.32 gr mixed plastic, 2.9 gr pure board pieces, 89.74 gr mixed board pieces, 3.52 gr pure ceramics, 7.28 gr mixed ceramics. The XRF (X-ray fluorescence spectrometry) results on the printed circuit board (PCB) after comminution got the highest element, namely copper at 17.91%, and became the object of research observation. All experiments on the cyclic voltammetry test resulted in a voltammogram with an

irreversible type. The addition of water to the deep eutectic solvent (DES) can affect the peaks of oxidation and reduction and theoretically, current efficiency 99.83% and optimum results occur at a temperature of 60 oC in the test of ChCl:Ethylen glykol (Ethaline) type diluted deep eutectic solvent (DDES) with potential Ep = 5.3085 volts and Ep/2 = 5.3081 volts. The results of SEM-EDX analysis on platinum (Pt) plates from diluted deep eutectic solvent (DDES) ChCl:Ethylen glykol (Ethalin) and ChCl:thiourea (Reline) were able to spontaneously deposit copper minerals to the surface of platinum (Pt) plates. Meanwhile, Glaline solution was unable to deposit the desired metal.