INTISARI

Penelitian ini dilakukan untuk memisahkan *lithium* dari campuran *lithium-cobalt*. Hal yang dipelajari dalam penelitian ini adalah faktor-faktor yang mempengaruhi performa elektrodialisis, seperti tegangan listrik, laju alir, konsentrasi ion, dan konsentrasi zat pengkhelat. Performa elektrodialisis dalam penelitian ini dinyatakan sebagai kapasitas pemisahan ion (% P), ion fluks (J), efisiensi arus (EC), serta konsumsi energi (E). Elektrodialisis untuk memisahkan *lithium* dari *lithium-cobalt* dilakukan dengan membran penukar ion standar, membran bipolar, dan membran monovalen. Pemisahan lithium menggunakan membran bipolar dan membran penukar ion standar didahului oleh proses titrasi kompleksometri dengan dengan EDTA untuk membentuk komplek kobalt-EDTA.

Aplikasi elektrodialisis untuk pemisahan litium dari campuran litium-kobalt dilakukan dengan alat elektrodialisis PC Cell BED 64004 yang diproduksi oleh *PCA-Polymerchemic Altmeier, GmbH, Heusweiler, Germany.* Pengaruh tegangan listrik dipelajari dengan memvariasikan tegangan ke 5, 10, 15, dan 20 volt. Pengaruh laju alir dipelajari dengan memvariasikan laju aliran menjadi 10, 15, dan 20 L/jam. Pengaruh konsentrasi ion dipelajari dengan memvariasikan rasio konsentrasi *lithium-cobalt* menjadi 100-100 mg/L; 100-300 mg/L, dan 100-400 mg/L. Pengaruh konsentrasi zat pengkelat dipelajari dengan memvariasikan rasio konsentrasi cobalt-EDTA mejadi (1:1), (1:2), dan (1:3). Gugus fungsi membran penukar ion dianalisis dengan FTIR. Morfologi permukaan membran dianalisis dengan SEM. Struktur kompleks Co-EDTA dianalisis dengan spektrofotometri UV-vis

Korelasi tegangan listrik, laju alir, dan konsentrasi ion terhadap performa elektrodialisis monovalen membran dinyatakan sebagai kapasitas pemisahan ion lithium, efisiensi arus, dan konsumsi energi. Korelasi tegangan listrik terhadap performa elektrodialisis tersebut membentuk sebuah persamaan polinomial, persamaan *power*, dan persamaan linear. Korelasi laju alir terhadap performa elektrodialisis membentuk persamaan polinomial orde 2. Korelasi rasio konsentrasi Li:Co terhadap performa elektrodialisis membentuk persamaan logaritmik dan linear. Korelasi tegangan listrik dan rasio konsentrasi Co:EDTA terhadap performa elektrodialisis standar-bipolar membran dinyatakan sebagai kapasitas pemisahan ion lithium, efisiensi arus, dan konsumsi energi. Korelasi tegangan listrik terhadap performa elektrodialisis tersebut membentuk sebuah persamaan logaritma, persamaan linear, dan persamaan eksponensial. Korelasi rasio konsentrasi Co:EDTA terhadap performa elektrodialisis membentuk persamaan persamaan logaritmik. Hasil penelitian menunjukkan bahwa membran penukar ion monovalen, (MVK, MVA, PC Cell GmbH) memiliki gugus fungsi yang sama dengan membran penukar ion standar (PSK, PSA, PC CellGmbH). Struktur kompleks Co-EDTA yang dibentuk pada penelitian adalah (Co (II) EDTA) $^{2-}$.

Kata Kunci: Elektrodialisis, Litium-Kobalt, Monovalen Membran, Bipolar Membran

ABSTRACT

In this research, electrodialysis was applied to separate lithium from the mixture of lithium-cobalt. The research studied about the factors that affect the performance of electrodialysis, such as applied voltage, flow rate, initial concentration of ion, and initial concentration of chelating agent. Electrodialysis performances in this research were expressed as the ion separation capacity (% P), ion flux (J), current efficiency (EC), as well as the energy consumption (E). The application of electrodialysis to separate lithium from lithium-cobalt mixture was conducted using standard ion exchange membranes, bipolar membranes, and monovalent membranes. Separation of lithium using standard ion exchange membrane-bipolar membrane was preceded by complexometric titration using EDTA to form cobalt-EDTA complex.

The research to separate lithium from lithium-cobalt mixture was conducted using electrodialysis cell BED 64004 produced by *PCA-Polymerchemic Altmeier, GmbH, Heusweiler, Germany.* The effects of applied voltage were studied by varying the voltage to 5, 10, 15, and 20 volt. The effects of flow rate were studied by varying the flow rate to 10, 15, and 20 L /hr. The effects of initial concentration of ion were studied by varying the ratio of lithium-cobalt into 100-100 mg L; 100-300 mg/L, and 100-400 mg/L. The effects of initial concentration of chelating agent were studied by varying the ratio of cobalt-EDTA concentration ratio into (1:1), (1:2) and (1:3). Functional group of cation exchange membrane was analyzed by FTIR. The morphology of ion exchange membrane surface was analyzed by SEM. Co-EDTA complex structure was analyzed by UV-vis spectrophotometry

The correlation of applied voltage, flow rate, and initial concentration of ion to the monovalent membrane-electrodialysis performances were expressed by separation capacity of lithium, current efficiency, and energy consumption. The correlation of applied voltage to the mentioned electrodialysis performances formed polynomial equation, power equation, and linear equation. The Correlation of flow rate to the electrodialysis performance formed the 2^{nd} order of polynomial equation. The correlation of initial ion concentration to the the mentioned electrodialysis performances formed logarithmic and linear equation. The correlation of applied voltage and initial concentration ratio of Co:EDTA to the standard-bipolar membrane-electrodialysis performances were expressed by separation capacity of lithium ion, current efficiency, and energy consumption. The correlation of applied voltage to the mentioned electrodialysis performances formed logarithmic equation, power equation, and exponential equation. The correlation of initial concentration ratio of Co:EDTA concentration to the electrodialysis performances formed logarithmic equation. The results showed that monovalent ion exchange membranes, (MVK, MVA, PC Cell GmbH) have similar functional group to standard ion exchange membrane (PSK, PSA, PC Cell GmbH). The structure of Co-EDTA complex formed on research was $(Co(II)EDTA)^{2-}$.

Keyword: Electrodialysis; Lithium-Cobalt; Monovalent Membrane, Bipolar Membrane