Perolehan Kembali Logam Nikel dari Limbah Katalis Steam Reforming NiO/Al2O3 Melalui Kombinasi Metode Leaching Asam Tartrat dan Ekstraksi Cair-Cair dengan Cyanex 272 = Recovery Process of Nickel from Spent Steam Reforming Catalyst NiO/Al2O3 by Combination Methods of Tartaric Acid Leaching and Solvent Extraction with Cyanex 272

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Abstrak

Indonesia sedang membangun pabrik katalis yang memiliki kapasitas produksi 800 ton per tahun demi memenuhi kebutuhan katalis dalam negeri, di mana pembangunan pabrik katalis ini akan memberikan dampak terhadap ketersediaan sumber bahan baku. Secara umum, katalis terdiri atas logam berharga, seperti nikel yang memiliki nilai jual sebesar $22.000 per metrik ton dan dapat digunakan kembali guna menurunkan biaya produksi. Oleh karena itu, dalam penelitian ini dilakukan proses recovery logam nikel dari spent catalyst NiO/Al2O3 dengan efisiensi ekstraksi leaching tertinggi 76,28% pada kondisi operasi asam tartrat 1.5 M + 1% v/v H2O2, rasio S/L 20 g/L, temperatur reaksi 70 oC, waktu reaksi selama 4 jam dalam kecepatan agitasi 500 rpm, di mana proses leaching dikendalikan oleh difusi dengan energi aktivasi sebesar 2,29 kcal/mol. Kemudian, metode leaching dilanjutkan dengan ekstraksi cair-cair yang mampu mengekstrak logam nikel dari Pregnant Leach Solution (PLS) sebanyak 84,20% saat kondisi optimum Cyanex 272 1 M + 5% v/v TBP, pH fasa akuatik 9, temperatur reaksi 25 oC, waktu ekstraksi selama 1 jam dalam kecepatan agitasi 500 rpm.

.....Indonesia is planning to build a catalyst factory with a production capacity of 800 tons per year to meet domestic catalyst needs, however the construction of this catalyst plant will have an impact on the availability of raw material sources. In general, the catalyst contains heavy metal, such as nickel metal, which has a selling price of $22,000 per metric ton and can be reused in order to reduce costs. Therefore, in this research, the nickel metal recovery process from spent catalyst NiO/Al2O3 was carried out with the highest leaching extraction efficiency of 76.28% at 1.5 M tartaric acid + 1% v/v H2O2, S/L ratio 20 g/ L, reaction temperature 70 oC for 4 hours with an agitation speed of 500 rpm, where the leaching process is controlled by diffusion with an activation energy of 2.29 kcal/mol. Then, the leaching method was continued with liquid-liquid extraction which was able to extract nickel metal from Pregnant Leach Solution (PLS) as much as 84.20% when the optimum conditions were Cyanex 272 1 M + 5% v/v TBP, pH 9 of aqueous phase, reaction temperature 25 oC, for 1 hour at 500 rpm agitation speed.