

Abstrak

Platinum atau Pt merupakan salah satu logam berharga yang terdapat di kerak bumi. Deposit sumber alami platinum sangat terbatas yakni 66.000 ton di seluruh dunia dengan konsentrasi pada rentang 2-10 ppm atau bahkan ppb. Hal ini menyebabkan terjadinya potensi kelangkaan sehingga perlu dilakukan *recycling* atau *recovery* dari produk sekunder seperti *spent catalyst*.

Penelitian ini menggunakan *spent catalyst* yang merupakan limbah padat katalis yang berasal dari kolom dehidrogenasi proses pembuatan urea PT Pupuk Kujang. Aqua regia dan asam oksalat digunakan sebagai agen pelindi. Proses pelindian dilakukan pada tekanan atmosfer. Dalam penelitian ini beberapa mekanisme model pelindian menggunakan aqua regia telah diusulkan untuk mengevaluasi parameter kinetika. Pelindian *spent catalyst* dilakukan dengan variasi konsentrasi campuran dari aqua regia (9,836 M, 11,065 M dan 12,295 M) , suhu operasi (30⁰C,60⁰C,90⁰C) dan ukuran partikel (pellet, -20+40 mesh dan -200 mesh) . Perbandingan padatan/ cairan (w/v) adalah 1/5. Setiap percobaan untuk variasi konsentrasi campuran dengan ukuran partikel tertentu dimasukkan kedalam di labu leher tiga yang dilengkapi dengan pengaduk, kondensor dan *heating mantle*. Campuran dipanaskan sampai temperatur yang ditentukan. Lima mililiter sampel kemudian diambil menggunakan syringe dan pada waktu tertentu (menit ke- 5, 15, 30, 60, 120, 240) dan kemudian dianalisa menggunakan ICP untuk mengetahui konsentrasi logam-logam terlindi.

Hasil *recovery* tertinggi dari platinum dihasilkan ketika kondisi operasi: suhu= 90⁰C, ; ukuran partikel= -200 mesh, dan konsentrasi campuran aqua regia = 12, 295 M. Hasil “ *curve fitting* “ dari model-model yang digunakan menunjukkan bahwa *pseudohomogeneous first order reaction* memberikan persen kesalahan relatif terkecil dengan energi aktivasi yang dihasilkan sebesar 86,8 kJ/mol.

Kata kunci : Pelindian, *Spent catalyst*, Aqua Regia, Kinetika

Abstract

Platinum or Pt is one of the precious metals found in the earth's crust. Natural source deposits of platinum estimated only 66,000 tons worldwide with concentration ranging from 2-10 ppm or even ppb. This limited amount of platinum has consequence on the potential scarcity of platinum in the future. From this standpoint, recycling or recovery process platinum from secondary product is very necessary.

This study used spent catalyst as solid catalyst waste, which derived from the dehydrogenation column from urea manufacturing process. Aqua regia and oxalic were used as leaching agent. Leaching process was performed at atmospheric pressure. Several mechanisms of models for leaching using aqua regia have been proposed to evaluate the kinetic parameter. In this research, the leaching of spent catalyst using aqua regia has been done with varied mixture concentrations of aqua regia (9.836 M, 11.065 M and 12.295 M), temperatures (30⁰C, 60⁰C, and 90⁰C) and particle size (pellets, -20 + 40 mesh and -200 mesh) . The ratio solid/ liquid (w/v) was 1/5. The mixture of each of the prescribed concentration of aqua regia for a specified particle size was poured into a three neck flask equipped with stirrer, condensor and a heating mantle . The mixture was then heated up to a prescribe temperature. Five milliliters sample was sucked up using a syringe according to a prescribed time (5,15,30,60,120, 240 minutes) then were analyzed using ICP to determine the concentration of extracted metals.

The highest recovery pf platinum was obtained when its condition : temperature=90⁰C; particle size = -200 mesh and mixture concentration of aqua regia 12.295 M. The results of curve fitting of the imposed models show pseudohomogeneous first order reaction gives the lowest of error percentage and the value of activation energy is 86.8 kJ / mol.

Keywords: Leaching, Spent catalyst, Aqua Regia, Kinetics.