ABSTRAK

Proses Bayer telah secara umum digunakan dalam industri pengolahan bijih bauksit menjadi alumina. Dalam proses Bayer terdiri dari beberapa tahapan utama, yaitu *digestion*, klarifikasi, *seed precipitation*, dan kalsinasi. Penelitian ini mempelajari penggunaan teknologi dalam proses Bayer khususnya tahap *digestion* dan *seed precipitation*. Teknologi yang digunakan yaitu penambahan proses *pre-desilication* sebelum dilakukan *digestion* dan penambahan proses aglomerasi dalam *seed precipitation*.

Karakterisasi bijih dilakukan dengan pengujian *X-Ray Diffraction* (XRD) dan *X-Ray Flourescence* (XRF). Penelitian ini menggunakan bijih bauksit berjenis *gibbsite*. Mineral yang dominan pada bijih PT Borneo Alumina Indonesia adalah *gibbsite* ($Al(OH)_3$) dengan persentase 55%. Kemudian terdapat *hematite* (Fe_2O_3) dengan persentase 5,6%. *Goethite* ($FeO(OH)$) dengan persentase 13,5%. *Kaolinite* ($Al_2Si_2O_5(OH)_4$) dengan persentase 6,87%. Kuarsa (SiO_2) dengan persentase 15,24%. *Illite* ($(K.H_2O)Al_2[(Al.Si)(Si_3O_{10})](OH)_2$) dengan persentase 1,27%. *Rutile* (TiO_2) dengan persentase 0,73%. Mineral lain dengan persentase 1,79%.

Pada penelitian dilakukan perhitungan laju reaksi dengan penentuan perhitungan laju reaksi dilakukan berdasarkan uji linieritas plot. Pada *pre-desilication* laju reaksi dihitung menggunakan persamaan reaksi orde dua dengan hasil nilai konstanta laju reaksi k = 0,0133 L/gr.h dihitung dari perubahan *kaolinite* menjadi produk desilikasi. Pada *digestion* laju reaksi dihitung menggunakan persamaan reaksi orde satu dengan hasil nilai konstanta laju reaksi k = 0,0329/menit dihitung dari perbandingan hasil *X-Ray Fluorescence* (XRF) antara umpan proses dan residu proses dilihat dari jumlah *tri-hydrate alumina*. Pada *pre-desilication* dan *digestion* dilakukan perhitungan laju reaksi pengurangan silika menggunakan persamaan reaksi orde nol dengan hasil nilai laju reaksi secara berurutan k = 0,073 h.gr/L dan k = 0,0393 h.gr/L.

Kata kunci: bijih bauksit, unit pre-desilikasi, *digestion*, *seed precipitation*

ABSTRACT

The Bayer process is widely used in the industrial processing of bauxite ore into alumina. The Bayer process consists of several main stages, including digestion, clarification, seed precipitation, and calcination. This study examines the application of technology in the Bayer process, particularly focusing on the digestion and seed precipitation stages. The technologies applied include the addition of pre-desilication prior to digestion and agglomeration during seed precipitation.

The characterization of the ore was conducted using X-Ray Diffraction (XRD) and X-Ray Fluorescence (XRF) tests. This study used gibbsite-type bauxite ore. The dominant mineral in the ore from PT Borneo Alumina Indonesia was gibbsite (Al(OH)3), with a percentage of 55%. Other identified minerals included hematite (Fe2O3) at 5.6%, goethite (FeO(OH)) at 13.5%, kaolinite (Al2Si2O5(OH)4) at 6.87%, quartz (SiO2) at 15.24%, illite (K.H2O)Al2(Al.Si)(Si3O10)2) at 1.27%, rutile (TiO2) at 0.73%, and other minerals at 1.79%.

In this research, reaction rate calculations were performed based on the linearity test of the plot. The reaction rate for the pre-desilication process was calculated using a second-order reaction equation, yielding a reaction rate constant of k = 0.0133 L/g·h, which was derived from the transformation of kaolinite into desilication products. For the digestion process, the reaction rate was calculated using a first-order reaction equation, resulting in a rate constant of k = 0.0329/min, based on the comparison of X-Ray Fluorescence (XRF) of tri hydrate alumina results between feed process and residue process. Additionally, the silica reduction rate for both pre-desilication and digestion was calculated using a zero-order reaction equation, with reaction rate constants of k = 0.073 h·g/L and k = 0.0393 h·g/L, respectively.
Keywords: bauxite, pre-desilication unit, digestion, seed precipitation