Synthesis Al$_2$O$_3$ Powder Using Metal-Dissolved Acid Methods

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Abstract

The metal-dissolved method has been implemented on the synthesis of Al$_2$O$_3$ with temperature variations and the addition of polyethylene glycol (PEG). The basic materials used in this study were aluminum powder (Al Merck), HCl (Merck 37%) and PEG as a template (PEG 400 and 1000). Al$_2$O$_3$ synthesis was performed using metal-dissolved acid methods for about one-hour calcinations on temperature variation of 100°C, 300°C, 900 °C, 1000°C, 1050°C and 1100°C. The phase characterization was performed using X-ray diffractometer (XRD), where the data were then analysed phase identification, composition calculation and crystallites size estimation. The analyses showed that there were phase changes with calcination temperature, which was originally formed chloraluminite (AlCl$_3$·H$_2$O) after drying then into amorphous phase and Al$_2$O$_3$ intermediate phases below 1100°C and then stable corundum (α-Al$_2$O$_3$) at 1100°C. The addition of PEG affected the crystal size, eg. after 1100°C calcination, the crystallite size of corundum was 235 nm for sample without PEG, but then decreases to 217 nm for the PEG400 added sample and then to 139 nm for the PEG1000 added sample.
Keywords: Choraluminite, amorphous $\text{Al}_2\text{O}_3$, intermediate $\text{Al}_2\text{O}_3$ phases, $\alpha$-$\text{Al}_2\text{O}_3$, XRD, PEG, Metal dissolved acid method