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MECHANICAL ACTIVATION OF BOEHMITE PRODUCED BY THERMAL TRANSFORMATION OF GIBBSITE

T. C. Alex*[1], Rakesh Kumar[1], S. K. Roy[2] and S. P. Mehrotra[3]
[1] National Metallurgical Laboratory, Jamshedpur, PIN 831007, India
[2] Metallurgical & Materials Engineering Department, Indian Institute of Technology, Kharagpur PIN 721 302 , India
[3] Materials and Metallurgical Engineering Department, Indian Institute of Technology, Kanpur PIN 208 016, India.
*Email: tc_alex@yahoo.com

ABSTRACT

The Boehmite (γ- AlOOH), widely used as a precursor material for various applications, is a difficult to treat material compared to its trihydroxide gibbsite [γ- $Al(OH)_3$]. Structural changes during mechanical activation make it an attractive option to deal with such difficult to treat materials. This paper presents the effects of mechanical activation on the structure and reactivity of boehmite. Mechanical activation of boehmite derived from thermal decomposition of gibbsite was carried out on a planetary mill. The milled products were characterised by particle size, XRD, TG-DTA, FTIR. The reactivity of the activated boehmite was studied by alkali leaching. XRD studies showed that the starting material was X-ray pure boehmite. Particle size determined by laser diffraction based instrument showed that grinding equilibrium is reached within 30 minutes under the conditions used. The minimum d_{50} of the particle were about 6μm whereas the d_{10} was in the sub micron range. Appearance no new peaks in XRD spectra confirmed no phase formation during the course of mechanical activation. However drastic changes in the peak characteristics could be seen with mechanical activation. The peak intensity of all the peaks decreased while the integral width increased with mechanical activation. This indicated a decrease in crystallite size and increase in accumulation of strain in the boehmite structure. The thermal profile of the samples, obtained from simultaneous TG-DTA analyser also showed systematic variation with increase in mechanical activation. The boehmite to γ-Al_2O_3 transition temperature decreased with mechanical activation. On the other hand removal of physically adsorbed water molecules was becoming increasingly difficult. Additionally an exothermic peak, which was not observed in the case of unmilled boehmite in the temperature range under the study, appeared The intensity of this peak decreased with a decrease in mechanical activation time and not visible below 60 minutes of activation. The FTIR spectra also exhibited the structural changes. Changes in the nature of both the Al-O bonds as well as that of H-OH bonds indicated structural changes in the boehmite structure with mechanical activation time. The changes note in XRD, TG-DTA and FTIR studies signified changes in its reactivity. The results of alkali leaching of the activated boehmite substantiated the increase in reactivity ensued from mechanical activation.