

## Abstract

Nanosized alumina has been synthesized by employing an inorganic aluminum salt that is aluminum chloride and urea as precursors by sol-gel method. During the course of this reaction, gelation of aluminum hydroxide occurred in a pH regime which produced alumina nanoparticles. Nano sized alumina was studied for its densification behavior subject to average particle size, and heating rate. Nano powders obtained with a range of average particle size and narrow distribution manifested two different grain and pore growth during microstructural developments. Densification temperature decreases in general with the decrease in average particle size though the distribution of particle size as a function of heating rate manifested different grain growth and subsequent densification. At lower heating rate 5 °C, the particles showed bimodal grain growth with bigger average grain about 3 micron and closure(densified) of bigger pores at elevated temperatures 1600 °C. While at higher heating rate, 50 °C, the particles showed normal grain growth, about 1 micron with closure of pores at relatively 200°C lower temperatures. The densification and microscopic studies of alumina  $Al_2O_3$  owe to its versatile structural and functional properties such as high thermal conductivity, high hardness, and a good resistance to corrosion and abrasion, Scanning Electron Microscopy techniques were employed to characterize the Nano powders.

**Keywords:** Nano alumina precursors, aluminum chloride, sintering, densification,