World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:07, 2015

# Transformation of Aluminum Unstable Oxyhydroxides in Ultrafine α-Al2O3 in Presence of Various Seeds

**Authors :** T. Kuchukhidze, N. Jalagonia, Z. Phachulia, R. Chedia

**Abstract :** Ceramic obtained on the base of aluminum oxide has wide application range, because it has unique properties, for example, wear-resistance, dielectric characteristics, exploitation ability at high temperatures and in corrosive atmosphere. Low temperature synthesis of α-Al2O3 is energo-economical process and it is actual for developing technologies of corundum ceramics fabrication. In the present work possibilities of low temperature transformation of oxyhydroxides in α-Al2O3, during a presence of small amount of rare–earth elements compounds (also Th, Re), have been discussed. Aluminium unstable oxyhydroxides have been obtained by hydrolysis of aluminium isopropoxide, nitrates, sulphate, chloride in alkaline environment at 80-90ºC tempertures. β-Al(OH)3 has been received from aluminium powder by ultrasonic development. Drying of oxyhydroxide sol has been conducted with presence of various types seeds, which amount reaches 0,1-0,2% (mas). Neodymium, holmium, thorium, lanthanum, cerium, gadolinium, disprosium nitrates and rhenium carbonyls have been used as seeds and they have been added to the sol specimens in amount of 0.1-0.2% (mas) calculated on metals. Annealing of obtained gels is carried out at 70 – 1100ºC for 2 hrs. The same specimen transforms in α-Al2O3 at 1100ºC. At this temperature in case of presence of lanthanum and gadolinium transformation takes place by 70-85%. In case of presence of thorium stabilization of γ- and θ-phases takes place. It is established, that thorium causes inhibition of α-phase generation at 1100ºC, at the time in all other doped specimens α-phase is generated at lower temperatures (1000-1050ºC). During the work the following devices have been used: X-ray difractometer DRON-3M (Cu-Kα, Ni filter, 2º/min), High temperature vacuum furnace OXY-GON, electronic scanning microscopes Nikon ECLIPSE LV 150, NMM-800TRF, planetary mill Pulverisette 7 premium line, SHIMADZU Dynamic Ultra Micro Hardness Tester, DUH-211S, Analysette 12 Dyna sizer.

**Keywords :** α-Alumina, combustion, phase transformation, seeding
**Conference Title :** ICEMA 2015 : International Conference on Engineering Materials and Applications
**Conference Location :** Paris, France
**Conference Dates :** July 20-21, 2015