

## Transformation of Aluminum Unstable Oxyhydroxides in Ultrafine $\alpha$ -Al<sub>2</sub>O<sub>3</sub> 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  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> 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  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>, 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 80-90°C temperatures.  $\beta$ -Al(OH)<sub>3</sub> 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, dysprosium 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 - 1100°C for 2 hrs. The same specimen transforms in  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> at 1100°C. 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  $\gamma$ - and  $\theta$ -phases takes place. It is established, that thorium causes inhibition of  $\alpha$ -phase generation at 1100°C, at the time in all other doped specimens  $\alpha$ -phase is generated at lower temperatures (1000-1050°C). During the work the following devices have been used: X-ray diffractometer DRON-3M (Cu-K $\alpha$ , Ni filter, 2°/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 :**  $\alpha$ -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