Riga Technical University
Faculty of Material Science and Applied Chemistry

ABSTRACTS

of the
52nd International Scientific Conference
of Riga Technical University

Section:
Material Science and Applied Chemistry
October 13-15, 2011, Riga, Latvia

Riga 2011

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Influence of Ratio of Raw Materials on Porosity and Pore Size Distributions in Porous Mullite-Corundum Materials

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Compatibility of different properties in one material influences the development of our science and engineering. Such material is mullite and mullite-corundum high porosity refractory ceramics. Mullite formation in materials is carried out by using kaolin, alumina and silica as raw materials in corresponding ratio [1, 2]. The aim of this work is to investigate the influence of the different ratios of these raw materials on the porosity, pore size distribution and other properties.

Samples of porous mullite-corundum ceramic is prepared from the suspension of two types alumina α-Al_2O_3 (d_{50}=4μm) and γ-Al_2O_3 (d_{50}=80μm) (*Nabalox, Germany*), pure SiO_2 (d_{50}=6.94μm), kaolin (*MEKA, Germany*), aluminium paste (*Aquapor 9008*) - as pore former and distilled water. The Al_2O_3 and SiO_2 are in 2.57:1 ratio that conforms to mullite compositions ($3Al_2O_3 \cdot 2SiO_2$). Quantity of kaolin is 10, 20 and 30 wt.% of dry raw materials mass.

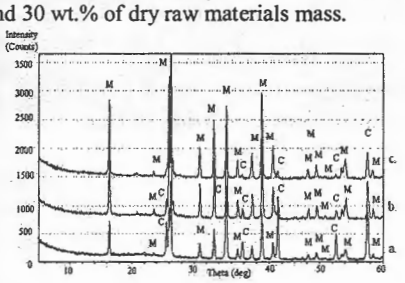

Fig.1 XRD patterns: 10 wt.% content of kaolin, fired at: a) 1650°C; b) 1700°C; c) 1750°C

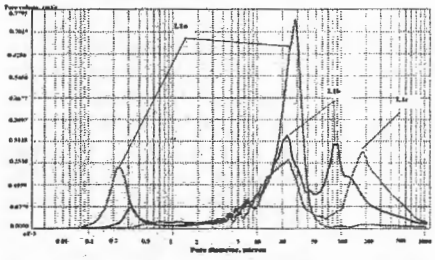

Fig.2 The pores sizes distribution of samples with 10 wt.% of kaolin sintered at: L1a-1650°C; L1b-1700°C; L1c-1750°C.

Pore formation occurs as a result of hydrogen formation in chemical reaction between aluminium paste and water when pH>7. The bulk density, bending strength, quantity of mullite phase, porosity of samples and shrinkage go up with increasing the amount of kaolin and the firing temperature. Mullite and corundum phases are formed when the firing temperature is 1700°C and the amount of kaolin is 10 wt.% [Fig.1], but in the samples from mix with 30 wt.% of kaolin-only mullite phase. Microporosity decreases with increase of sintering temperature [Fig.2].

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