# MEHANIZAM KRISTALIZACIJE GELOVA KORDIJERITNOG SASTAVA

# FORMATION MECHANISMS OF SOL-GEL DERIVED CORDIERITE

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Cordierite ($Mg_2Al_4Si_5O_8$) ceramics has a wide range of uses and applications due to its important properties like: low thermal expansion, small dielectric constant, high chemical and thermal stability [1].

The crystallization path of pre-cordierite powders prepared by sol-gel route has been studied. Set of different gels was prepared using various aluminum and magnesium compounds as precursors. The influence of precursors nature on the specific surface area, formation mechanism and sintering behavior of prepared gels was studied by the Brunauer-Emmett-Teller (BET) method, differential scanning calorimetry (DSC), X-ray diffraction (XRD) and determination of density of sintered bodies. Gels calcined at 700 °C are characterized by the different specific surface area and different path of crystallization. When aluminum and magnesium nitrates were used as precursors, gel was characterized by $S_{BET}$=122 $m^2g^{-1}$ and $\mu$-cordierite (with the structure of high-quartz) started to crystallize at about 870 °C. It transformed into $\alpha$-cordierite above 1000 °C. If aluminum was introduced as Al-butoxide, $S_{BET}$=16 $m^2g^{-1}$ and $\mu$- and $\alpha$-cordierite started to crystallize simultaneously at 900°C; and transformation of $\alpha$-cordierite occurred at 1000 °C. Using nano-sized $\gamma$-$Al_2O_3$ as the aluminum precursor, $S_{BET}$ =104 $m^2g^{-1}$ and spinel crystallized first at 850 °C. $\beta$-cordierite was formed at 1150 °C and above 1250 °C it transformed into $\alpha$-cordierite. Different sintering behavior of pre-cordierite powders was correlated with the nature of the used precursors.

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[1] N. T. Silva, C. A. Bertran, M. A. S. Oliviera, G. P. Thim, *J. Non-Cryst. Sol.* **304** (2002) 31-35.