10th INTERNATIONAL CONFERENCE ON COMPUTATIONAL AND EXPERIMENTAL SCIENCE AND ENGINEERING (ICCESEN-2023)
27-30 October 2023, ANTALYA -TURKEY

Abs. No: 256

Crystallization Kinetics Study of α-Cordierite from MgO–Al2O3–SiO2–TiO2

Ameur OUALI ✉, Smail LAMARA, Foudil SAHNOUNE
Physics and materials chemistry laboratory, Department of Physics, University of M'sila, 28000 M'sila, ALGERIA

ABSTRACT

Using DTA/TG thermal analysis, X-ray diffraction (XRD), and scanning electron microscopy (SEM), crystallization kinetics of -cordierite ceramic from MgO–Al2O3–SiO2–TiO2 glasses obtained through melt cooling are presented. Under 40 cm3/min argon gas flow, DTA experiments were carried out on samples ranging from room temperature to 1400 °C. This study utilized heating rates of 10, 20, 30, 40, and 50 °C/min. The sintered powders' phase transformations were characterized by XRD. Using DTA results, the activation energy values for cordierite formation were measured under both non-isothermal (Kissinger, Boswell, and Ozawa methods) and non-isothermal (Johnson–Mehl–Avrami (JMA) theory) treatments of 845 and 720 kJ mol-1, respectively. When non-isothermal treatments were used, the growth morphology parameters n (the Avrami parameter) were found to be close to 1.5, when isothermal treatments were used (the Ligero method), and Matusita et al. found that m (the numerical factor) was 1.5. The fact that the growth morphology parameters n and m are approximately 1.5 indicates a diffusion-controlled polyhedron-like three-dimensional growth from a constant number of nuclei.

Keywords: *Cordierite, Differential thermal analysis, Avrami parameter, Activation energy*

✉ *Corresponding Author Email : ameur.ouali @univ-msila.dz*