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SOLID STATE REACTION IN ALUMINA NANO-PARTICLES/LZSA GLASS-CERAMIC COMPOSITES

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The aim of this work is to present results related to solid state reactions on LZSA glass-ceramic composites containing alumina reinforcement nano-particles. A LZSA ($\text{Li}_2\text{O}-\text{ZrO}_2-\text{SiO}_2-\text{Al}_2\text{O}_3$) glass-ceramic has been prepared by sintering of powders and characterized. Composites containing 0 to 77 vol.% of alumina nanoparticles (27-43 nm APS, 35 m².g⁻¹ SSA) and a 16.9Li₂O•5.0ZrO₂•65.1SiO₂•8.6Al₂O₃ glass-ceramic matrix have been prepared. X-ray diffractometry studies have been performed in order of investigating the solid state reactions occurring in LZSA-based composites. Results of the XRD patterns have been related to the coefficient of thermal expansion (CTE), Young modulus, and dielectric constant, showing that, in comparison with the glass-ceramic composition, the composites showed a decrease of CTE with the alumina concentration increasing, due to the increasing of beta-spodumeness formation (solid solution of beta-spodumene, $\text{Li}_2\text{O}.\text{Al}_2\text{O}_3.4-10\text{SiO}_2$). The performance of the glass-ceramic was improved with the alumina nano-particles addition, showing potential of using in the preparation of Low Thermal Co-fired Ceramics (LTCC).