

Effect of CaF_2 addition on the densification behavior and mechanical properties of resistant anorthite and its bioactivity

S. Zaiou, O. Beldjebli, D. Belfennache, M. Tayeb, F. Zenikheri, A. Harabi

Abstract: In the current study, anorthite ceramic (CaO , Al_2O_3 , 2SiO_2) was synthesized by a simple solid-state reaction method, using local Algerian raw materials. The effect of sintering temperature at 800, 850, 900, 950, 1000, and 1100 °C for 1h under atmosphere, and 0.5, 1.5, and 3 wt % calcium fluoride (CaF_2) addition on the densification and mechanical properties of anorthite were studied. The correlation between these properties and the bioactivity of samples was investigated. The results showed that samples with 1.5 wt.% CaF_2 sintered at 900 °C has the highest bulk density (2.7 g.cm⁻³), lowest apparent porosity (3%), outstanding micro-hardness (8.7 GPa), and high flexural strength (222 MPa) of anorthite. The in vitro bioactivity test was assessed by determining the changes in surface composition and morphology after immersion in a simulated body fluid (SBF) for 8 h to 21 days. The results of the bioactivity test determined the formation of hydroxyapatite ($\text{Ca}_5(\text{PO}_4)_3\text{OH}$) on the sample surface after 3 days, suggesting it is a bioactive ceramic.

Keywords : anorthite, CaF_2 addition amount, bioactive properties Mechanical, sintering temperature