

Influence of Fluorine Concentration and Sintering Temperature on the Bioactivity of Apatite-Wollastonite Glass-Ceramics

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Abstract : In a spray pyrolysis process, apatite-Wollastonite glass-ceramics (AW GC) were fabricated with the composition $8.29\text{MgO}_{50.09-x}\text{CaO}_{34.46}\text{SiO}_2_{7.16}\text{P}_2\text{O}_5_x\text{CaF}_2$, where $x = 0, 0.54, \text{ and } 5.24$ (wt. %). Based on the results, it appears that the CaF_2 addition lowers the glass transition temperature (T_g) and crystallization temperature (T_c) of the glass composition. In addition, AW GC's bioactivity increases as the soaking time in simulated body fluid (SBF) increases. Adding CaF_2 and varying sintering temperatures altered the density and linear shrinkage percentage of the samples. The formation of fluorapatite with needle-like microstructure and the formation of the wollastonite phase was enhanced with higher CaF_2 content, while the growth of the whitlockite phase took place at a higher heat treatment temperature. Adding high CaF_2 content with high sintering temperatures to apatite Wollastonite glass-ceramic composition facilitates the formation of fluorapatite, which is crucial for denture glass-ceramics.

Keywords : apatite-wollastonite glass ceramics, bioactivity, hydroxyapatite, calcium fluoride

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