Use of Sodium Silicate Waste Solution as Si Source to Synthesize MgO-CaO-SiO_2 System Ceramic Powder for Biomedical Application

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The superior biological and mechanical properties of the glass ceramic of MgO-CaO-SiO_2 system [1], for fabricating bone scaffolds, have attracted considerable attention. Studies showed that glass-ceramic with the composition Wt% 7.68 MgO, 43.19 CaO and 49.13 SiO_2 displays appropriate mechanical properties, good bioactivity and biocompatibility in vitro [2]. The aim of this research was to propose a novel method of synthesis of MgO-CaO-SiO_2 system ceramic powder. Using a waste solution of sodium silicate derived from alkaline fusion process of zircon sand, as source of Si, MgO-CaO-SiO_2 system ceramic powder was synthesized by sol-gel added to co-precipitate of Mg and Ca hydroxides. Present synthesized powder was compacted and sintered at 1300 ^oC for 2h to obtain CaO-MgO-SiO_2 glass-ceramic that was characterized by SEM, XRD and FTIR. In vitro tests were performed by soaking the sintered samples in the simulate blood fluid (SBF, at pH 7.25 and 37 ^oC) to study its bioactivity. After 7 days soaking, FTIR spectra (Fig. 1) result showed the material is bioactive, confirmed by presence of infrared band at 1047 cm^{-1} attributed to PO_4^{3-} and observation of hydroxyapatite coating on the surface of the sample (Fig. 2). Cytotocicity test according to ISO10993-5 and sample preparation according to ISO10993-12 revealed that the sample is considered non-cytotoxic and it can be eligible for further biological testes.

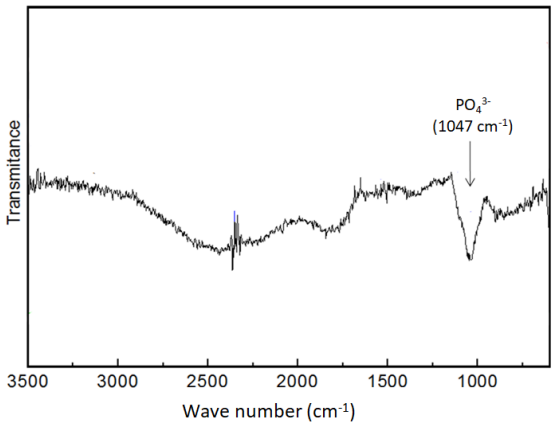

Fig. 1- FTIR spectra of CaO-MgO-SiO_2 glass-ceramic sintered at 1300 ^oC for 2h, after soaking in SBF for 7 days.

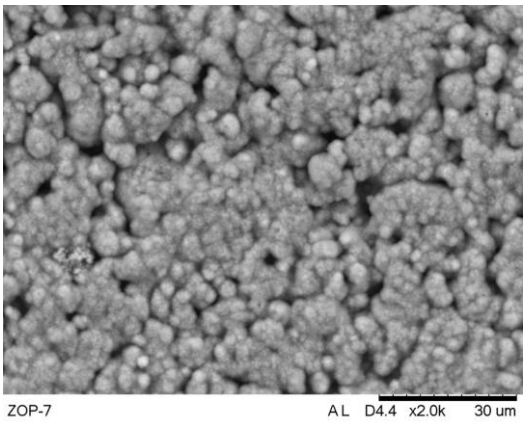

Fig.1- SEM micrographs of sintered CaO-MgO-SiO_2 glass-ceramic surface soaked in SBF for 7 days.

References

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