DISPERSED HYDROXYAPATITE IN MODIFIED 45S5 BIOGLASS CERAMIC : SINTERING BEHAVIOR OF GLASS MATRIX RANGING FROM 20 TO 30 WT% IN CALCIUM OXIDE INVESTIGATION

Silva, A. C.[1,2], Braga, F. J. C. [1, 2]

Mello-Castanho, S.R.H. [1]

[1]Instituto de Pesquisas Energéticas e Nucleares (IPEN), São Paulo (SP), Brasil
[2]Consulmat Materiais de Referência, Soluções e Serviços Ltda., São Carlos (SP), Brasil

e-mail: dasilva.ac@uol.com.br

Abstract.

Biomaterial technology plays an important role in cell-based tissue proliferation environment creation. The bioceramics are obtained and processed to provide specific physiological behavior for applications as bone grafts. bioceramics should be resorbable, thus acting as temporary material, gradually being replaced by new bone. Only in a few cases a pure biomaterial can gather all the desired characteristics to accomplish its function ideally. In this way the hydroxyapatite (HA) bioceramics are reference material to employment as a bone substitute, because it is a material that exhibits absence of local and systemic toxicity, absence of inflammatory responses and apparent ability to bind to host tissue. However, despite their promising biological properties, its low rate of bioactivity index (Ib) and its slow rate of degradation is presented as limiting factors for its application as bone graf.. In contrast, the bioglass (BG) is a resorbable biomaterial which has a high Ib, and osteoinductive propriety, which allows intracellular and extracellular interface response occurs in the living tissue, allowing the surface to be colonized by stem-cells free as result of surgical interventions. However, the bioglass easily reacts with body fluids and hydrolytic attack and can be absorbed at a rate too fast to allow effective bone tissue development. Composites are a combination of materials to gather the desired caractreristicas of the constituent phase. Seeking to combine the osteoconductive and osteoinductive properties of both materials (HA and BG), resulting in a biomaterial with properties suitable for improved application as bone grafts. An interesting feature of bioglass is their relatively low softening temperature, and formation of liquid phases. This characteristic allows the preparation of ceramic composites at temperatures below the decomposition temperatures of hydroxyapatite (around 1200ºC) in other words, bioglass acts as fluxing in HA/BG composites. In previous research the authors demonstrated that in material mechanical characteristics, the ideal ratio of hydroxyapatite and bioglass 45S5 is (30 / 70wt%). The present work objective the development of HA/BG (30/70wt%) composites, varying the wettability and chemical resistance of the glass matrix. to

achieve this goal three compositions of the 45S5 bioglass derived ranging from 20-30wt% in CaO were used in order to study the sintering behavior of these materials with hydroxyapatite 30wt% dispersed. The bioactive glasses were prepared by melting at 1500°C in platinum crucibles and annealed between 2 and 24 h at 500°C and commercial synthetic hydroxyapatite was used. The composites were uniaxially pressed in the form of cylinders and sintrerized up to (1100°C/1h). The characterization was made employing scanning electron microscopy, Infra-Red Spectrometry, X-ray diffraction and hydrolytic resistance test The results indicate the potential use of the materials developed for applications like bone graft. Low content of calcium oxide bioactive. The HA was partially degraded to β-TCP as observed by X-ray diffraction and FTIR technics. This degradation was approximately proportional to liquid phase wetting indicating phosphate-silicate compounds possible formation. The presence of β-TCP can be of interest to enhance the desired characteristics of the bio-composite. Improved sintering characteristics of low calcium bioglass and viability and the combintion of osteoconductive and osteoinductive properties of the each materials was indicated

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