

## Surface Modification of HA and TCP immersed in Simulated Body Fluid

A. Jaroenworuluck<sup>1</sup>, N. Koolpreechanan<sup>1</sup>, N. Kosachan<sup>1</sup> and R. Stevens<sup>2</sup>

<sup>1</sup>National Metal and Materials Technology Center

114 Thailand Science Park, Paholyothin Rd., Klong 1, Klong Luang, Pathumthani, Thailand

<sup>2</sup>Department of Mechanical Engineering, University of Bath, BA2 7AY,  
Bath, United Kingdom

**INTRODUCTION:** Calcium phosphate is recognized to be one of the more attractive candidate materials for bone replacement since the human skeleton consists of a composite of calcium phosphate crystals with a matrix phase of collagen. Kikubo et al. published a simulated chemically prepared body fluid (SBF) solution, designed to imitate human body fluid with ion concentrations approximating to those of the inorganic constituents of human blood plasma to demonstrate the similarity between in vitro and in vivo behavior of glass ceramic compositions [1-3]. We have studied the effect of different phases of Ca-hydroxyapatite on bioactivity by immersion in SBF. The samples were characterised after soaking in SBF for several predetermined time periods under a controlled environment of 37°C and pH 7.4.

**METHODS:** TCP-130 and 118 powders each having a different Ca/P were pressed into a metal mold having cylindrical shape 1 cm in diameter. TCP-118 was sintered at 1100, 1200, 1300 and 1400°C for 6 h with a heating rate of 5°C in an electric furnace. The pellets were then immersed for fixed periods in the SBF solution. Both the green and sintered samples were investigated after soaking in the SBF solution under controlled conditions at 37°C and pH 7.4. Simulated body fluid (SBF) was prepared by dissolving appropriate quantities of the precursor chemicals in deionized water, with ion concentrations nearly equal to those of the inorganic constituents of human blood plasma. Details of the preparation method were reported by Kokubo et al. [4]. The pellets of the green and sintered TCP samples immersed in SBF were investigated by X-ray diffractometry and Fourier transformation infrared spectrometry. Surface microstructure and grain size of the starting powders and samples were observed using SEM and EDX Transmission electron microscopy used to observed crystal structure and surface characteristics.

**RESULTS:** SEM micrographs of the unsintered and sintered TCP130 and TCP-118 immersed in SBF show crystals attached on the original surfaces. XRD, FT-IR and TEM analysis reveals that the deposits are nanosize crystalline CaP. After immersion, the amount of precipitation and the shape of grains precipitating on the original grain surfaces differed. For densified TCP-118 sintered at 1100°C, small needle-like crystals were apparent on the grain surfaces. On the other hand, a precipitated CaP platelike layer formed on the surface of TCP-118 sintered at 1400°C. It was found that the CaP pellet was completely covered with a homogeneous layer of flakes after 3 days immersion in SBF.

**DISCUSSION & CONCLUSIONS:** Calcium phosphate crystals were precipitated on the CaP ceramic surfaces after SBF immersion. All surfaces were covered by the precipitated crystals after just 3 days immersion. Different morphologies of the crystals precipitated on CaP phases dependent on the sintering temperature of the substrate. The induction period necessary for the nucleation of the precipitates was less than 24 h in SBF solution.

**REFERENCES:** <sup>1</sup>Tas A. C. (2000) *Biomaterials* **21**:1429-38. <sup>2</sup>Sender C.G. L., Joop G.C W., Marijke C. S., Joop S., John A. (2006) *Biomaterials* **27**:3368-78. <sup>3</sup>Ruixue S., Musen L., Yupen L, Aijuan W. (2006) *Materials Characterization* **56**:250-54. <sup>4</sup>Ohtsuki C, "How to prepare the simulated body fluid (SBF) and its related solutions" proposed by Kokubo et al.

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