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POROUS CALCIUM PHOSPHATE/CHITOSAN/ALGINATE SCAFFOLDS FOR TISSUE ENGINEERING

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INTRODUCTION: Porous biomaterials are widely used for bone replacement and regeneration as well as in scaffolds for bone tissue engineering. Hydroxyapatite (HA) and other calcium phosphate compounds have been proposed as possible substitute materials for hard tissue and scaffold due to their chemical and crystallographic similarity with the carbonated apatite present in human bones and teeth. Several methods have been developed for scaffold preparation using porous bioceramics[1]. The porous ceramics (CPC) need to be highly biocompatible, bioactive, osteoconductive and even osteoinductive. Many porous bone substitutes have nevertheless limited practical applications due to their poor mechanical properties. Attempts were made to increase the strength of CPC while forming micropores by using water soluble mannitol crystals as pore forming agents [2]. The incorporation of chitosan in CPC structures was found to significantly increase the CPC strength and strain before failure [3, 4]. In this paper we report the development of new formulations calcium phosphate porous cements on the basis of hydroxyapatite (HA), α-tricalcium-phosphate (α-TCP), chitosan (Ch) and Na-alginate (Alg).

METHODS: Two hydroxyapatite with different particle size (HA1: D(50) = 48 nm and HA2: D(50) = 4.14 μm) and an α-TCP: D(50)= 10,63 μm were used as starting materials. Ch (M_n= 415.000; DA=79%) and Alg (Sigma Aldrich) were used as reinforcing materials. For the two natural polymers used in the study the optimal reticulation ratio Ch/Alg was found to be 1/3 w/w. Six porous calcium phosphate cements were synthesized and characterized. All samples were sintered at 1050 ^{o}C. The compressive strength, surface morphology, X-ray diffraction patterns and thermal stability were measured for all the samples.

RESULTS: XRD pattern and SEM micrographs for the sample with composition 40% HA1, 20% α-TCP, 23% Ch, 17% Alg are presented in fig. 1-3.

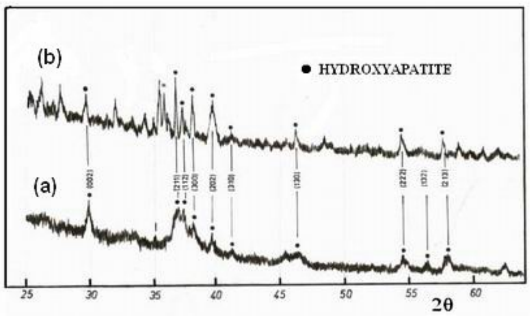

Fig. 1: XRD patterns for sample C3 before and after thermal treatment

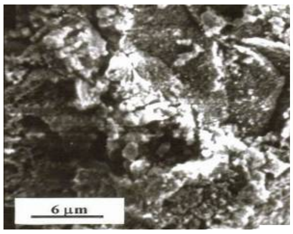

Fig. 2: Final structure of the sample C3

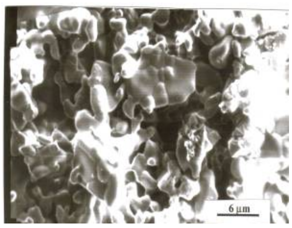

Fig.3: SEM micrograph of the sintered porous calciu phosphate

DISCUSSION & CONCLUSIONS: Most sintered samples show higher porosity but lower mechanical resistance.

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