11TH CONFERENCE
FOR YOUNG SCIENTISTS IN CERAMICS

Satellite event:
ESR COST IC1208 Workshop

BOOK OF ABSTRACTS

October 21-24, 2105
Faculty of Technology
Novi Sad, Serbia

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PROGRAMME
and
BOOK OF ABSTRACTS

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MIXED-ANIONIC CALCIUM PHOSPHATE POWDERS FOR BIORESORBABLE CERAMIC

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The fabrication of nanosized bioceramic particles is of great interest for many applications, including setting bone cements, high strength synthetic porous or non-porous bone grafts and other composites with complex structure. At the moment the idea of usage of materials with high resorption rate is becoming attractive to the researches. This challenge demands the synthesis of calcium phosphates with controllable Ca/P ratio less than 1.5. This approach is necessary to manipulate ceramics properties in a wide range, e.g. resorption rate, which is crucially important to design biomaterial for personalized care. Thus, the usage of condensed phosphates is required. Condensed ammonium phosphates are the most preferring ones while they are able to minimize the influence of precursor co-products on the ceramics structure and composition. However, the information about condensed ammonium phosphate preparation, purity and stability, presented in special reviews, turns out to be controversial, and, in addition, the thermal synthesis of individual condensed phosphates is impossible.

The main goal of this work was the synthesis of amorphous precursors for the biphasic ceramic with pre-determined Ca/P ratio between 0.5 and 1.5. In the course of the work we developed several routs of condensed ammonium phosphate synthesis for subsequent precursor obtainment and, finally, fabricated biphasic ceramics through thermal treatment of the precursors.

In the present work ammonium phosphates were synthesized by various methods with the help of ion-exchange resins and phosphates of nitrogen-containing organic bases. At the next step we obtained amorphous chemically mixed anionic precipitates by co-precipitation. Synthesis of the precursor was performed by pouring solution of calcium nitrate to solution of several condensed ammonium phosphates. The calcination of the precursor led to the formation of biphasic ceramic material characterized by submicron grain size.

As a result, we have produced a number of precursors for biphasic ceramics based on resorbable calcium phosphates with pre-determined Ca/P ratio. Obtained condensed ammonium phosphates were proved to be pure individual substances by XRD. The main aspects of sintering, microstructure and quality of the obtained material and amorphous precursors were analyzed by XRD, scanning electron microscopy, thermal analysis and mechanical tests. Thus, we can regulate composition of the ceramics at the stage of precursor synthesis and create the whole range of materials with variable Ca/P ratio and tunable properties.