
XX
MENDELEEV CONGRESS
on general and applied chemistry

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# VOLUME 2b

# CHEMISTRY AND TECHNOLOGY OF MATERIALS AND NANOMATERIALS

**ABSTRACT BOOK**
**in 5 volumes**

26–30 September
EKATERINBURG • 2016

**XX Mendeleev Congress on general and applied chemistry.**
Five-volumes book. Vol. 2b : abstracts. – Ekaterinburg : Ural Branch of the Russian Academy of Sciences, 2016. – 448 p.

ISBN 978-5-7691-2451-8
Vol. 2b. Chemistry and technology of materials and nanomaterials

Volume 2b includes poster and correspondent presentations of the section: «Chemistry and technology of materials and nanomaterials».

**The XX Mendeleev Congress is held under the auspices of the International Union of Pure and Applied Chemistry (IUPAC)**

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**CONTENT**

# THE SYNTHESIS OF CALCIUM PHOSPHATES POWDERS FROM CALCIUM SALTS OF CARBOXYLIC ACIDS

**Safronova T.V., Putlyaev V.I., Knotko A.V., Shatalova T.B., Kurbatova S.A., Mukhin, E.A., Kazakova G.K., Cherkasova G.S.**

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Porous materials with a specified geometry of the pore space can be fabricated using 3D stereolithographic printing from the suspension of fine inorganic powder in the mixture of monomers. Polymerization of monomers takes place under the action of ultraviolet radiation. To increase the print resolution of the 3D stereolithographic printing the dye is added in the composition of such suspensions. The resolution is significantly enhanced by the use of carbon as a colorant.

In this work it was proposed to give a color to the white powders of synthetic calcium phosphates (CP) by means of conducting of heat treatment of the powders at 500-800oC for carbonization of adsorbed reaction by-product (ARB). ARB, which was able to carbonizate, was formed during the synthesis of CP from calcium salts of carboxylic acids (formiate, acetate, lactate, malates, citrate, sacharetes) and various ammonium phosphates or phosphoric acids.


***Figure 1.*** *$Ca_2P_2O_7$ powders, synthesized from $Ca(CH_3COO)_2$ and $(NH_4)_4P_2O_7$, after heat treatment at different temperatures.*

Hydrated CP with the ratio of Ca/P in the range of 0,5-1,67: $Ca(PO_3)_2 \cdot xH_2O$ (Ca/P=0,5), $CaHPO_4 \cdot 2H_2O$ (Ca/P=1), $Ca_2P_2O_7 \cdot xH_2O$ (Ca/P=1), $Ca_8(HPO_4)_2(PO_4)_4 \cdot 5H_2O$ (Ca/P=1,33), $Ca_3(PO_4)_2 \cdot xH_2O$ (Ca/P=1,5), $Ca_{10}(PO_4)_6(OH)_2$ (Ca/P=1,67), and the double phosphate of calcium/ammonium (for example, $Ca(NH_4)_4H(P_2O_7)_2$ (Ca/P=0,25), $Ca(NH_4)_2(HPO_4)_2 \cdot H_2O$ (Ca/P=0,5) or $Ca_3(NH_4)_2(P_2O_7)_2 \cdot 6H_2O$ (Ca/P=0,75) were obtained. In some cases, the powders after the synthesis were a mixture of 2 or 3 of listed products. In some cases, the powders after the synthesis were a mixture of 2-3 of listed products. But the phase composition of ceramics produced from the colored powders, after firing in the range 900-1200°C, corresponded to the ratio of Ca/P в in the desired interval (0,5-1,67).

This work was supported by RSF, grant 15-19-00103.