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Book of abstracts contains theses of plenary, keynote, oral and poster presintations which were presented on **Mendeleev 2021**, the XII International Conference on Chemistry for Young Scientists. The Mendeleev 2021 Conference hold in Saint Petersburg (September 6–10, 2021).

Abstracts presented in the original edition

SYNTHESIS OF MAGNESIUM PHOSPHATES WITH Mg/P=1 RATIO FROM AMMONIUM HYDROPHOSPHATE AND VARIOUS MAGNESIUM SALTS

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The aim of this work was to synthesize and study the properties of magnesium phosphate powders derived by interaction of aqueous solutions of various magnesium salts and dibasicammonium phosphate to produce resorbable ceramic materials.

The synthesis was carried out by precipitation from aqueous solutions of dibasicammonium phosphate and magnesium salts (nitrates, acetates and chlorides) to produce highly dispersive powders with a narrow particle distribution. In the first series of synthesis, the solution of dibasicammonium phosphate was added to the solution of chloride, nitrate and magnesium acetate. In the second series of synthesis, solutions of chloride, nitrate and magnesium acetate were added to the dibasicammonium phosphate solution. The quantity of reagents (dibasicammonium phosphate and soluble magnesium salts) were calculated using the reaction equations (1, 2 and 3):

$$2Mg(NO_3)_2 + 2(NH_4)_2HPO_4 + 9H_2O \rightarrow MgNH_4PO_4{\cdot}6H_2O + MgHPO_4{\cdot}3H_2O + 3NH_4NO_3 + HNO_3 \quad (1)$$

$$2MgCl_2 + 2(NH_4)_2HPO_4 + 9H_2O \rightarrow MgNH_4PO_4{\cdot}6H_2O + MgHPO_4{\cdot}3H_2O + 3NH_4Cl + HCl \quad (2)$$

$$2Mg(CH_3COO)_2 + 2(NH_4)_2HPO_4 + 9H_2O \rightarrow MgNH_4PO_4{\cdot}6H_2O + MgHPO_4{\cdot}3H_2O + 3CH_3COONH_4 + CH_3COOH \quad (3)$$

The adding of one salt solution of the chosen pair of precursors was carried out using a drip funnel for an hour and at room temperature, using a magnetic stirrer to agitating the accepting solution of another salt and resultant suspension. The resulting suspensions of particles of magnesium insoluble salt in mother liquor then were left for 24 hours under stirring. The precipitate were then separated by decantation and filtered at reduced pressure on a paper filter of Buchner funnel. The filtered precipitate was dried in the air at room temperature until it completely dried out. Then powder was disaggregated using planetary mill and acetone as a liquid medium. After disaggregation and evaporation of acetone at room temperature, the powders were passed through the sieve. Later on, the obtained powder (a mixture of struvite $MgNH_4PO_4{\cdot}6H_2O$ and newberite $MgHPO_4{\cdot}3H_2O$) was investigated using various research methods (XRD, SEM, thermal analysis, granulometry). In the next step, the prepared powder mixture was pressed into tablets at a specific pressure of 50 MPa. Compacted powder preceramic samples were then fired in a range of temperatures from 800℃ to 1200℃ with a step of 100℃. The following substances were examined with XRD and SEM. According to the XRD the phase composition of ceramic samples prepared based on powders of all 6 syntheses after heat treatment at different temperatures was presented by magnesium pyrophosphate ($Mg_2P_2O_7$).

So a mixture of struvite $MgNH_4PO_4{\cdot}6H_2O$ and newberite $MgHPO_4{\cdot}3H_2O$ with different phase ratios was obtained from aqueous solutions of magnesium salts and dibasicammonium phosphate. It has also been found that the properties of synthesized powders was dependent on the receiving salt solution, i.e. sequence of solution adding. The ratio of the of struvite to newberite phases in case of addition of $MgCl_2$ to $(NH_4)_2HPO_4$ was 1:3; at the return sequence of solution addition ($(NH_4)_2HPO_4$ to $MgCl_2$), the ratio of struvite to newberite was 1:1. The ratio of the of struvite to newberite phases in case of addition of $Mg(CH_3COO)_2$ to $(NH_4)_2HPO_4$ was 5:1; at the return sequence of solution addition (of $(NH_4)_2HPO_4$ to $Mg(CH_3COO)_2$) the ratio of struvite to newberite was 8:3. When $Mg(NO_3)_2$ and $(NH_4)_2HPO_4$ are merged, the same ratio of struvite to newberite was observed as1:2.

It has been established that a powdered mixture of struvite and newberite during firing at temperature in the range 800℃ to 1200℃ formed a porous ceramic material based on the high temperature modification of magnesium pyrophosphate $Mg_2P_2O_7$.

Ceramic porous materials containing a biocompatible and bioresorbable phase of high temperature modification of magnesium pyrophosphate $Mg_2P_2O_7$ can be used for creating bone implants and also as a filler in composite materials with a polymer or inorganic matrix.

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