Electronic supplementary materials *Mendeleev Commun.*, 2023, **33**, 531–533

Ceramics based on double magnesium–sodium phosphates for bone regeneration

Ilya I. Preobrazhenskiy and Valery I. Putlyaev

Experiment Description:

Magnesium pyrophosphate was obtained by calcination of struvite, the later was obtained by precipitation from the solutions. The 0.5M $MgCl_2$ solution was added dropwise to the stoichiometric amount of 0.15M $(NH_4)_2HPO_4$ solution under vigorous stirring. The resulting suspension was aged under mixing for two hours at room temperature. Finally, magnesium pyrophosphate was obtained by thermal decomposition of struvite at 1100°C. Magnesium orthophosphate was synthesized by a solid-phase method from a mixture of magnesium oxide MgO and magnesium pyrophosphate $Mg_2P_2O_7$. MgO was prepared by calcination of magnesium carbonate, $MgCO_3$, at 600°C for 3 hours.

Equipment Description:

To study the qualitative X-ray phase analysis of the obtained magnesium phosphate powders a Rigaku D/Max2500 X-ray diffractometer with a rotating anode (Japan) using CuKα radiation (λ = 1.5406 Å) was used. Investigation's parameters: angle interval of 2θ = 2-70°, step of 2θ = 0.02°, speed of spectra registration - 5 °/min. The IR absorption spectra of the prepared samples were recorded on the Nikolet Avatar-330 infrared Fourier spectrometer (Thermo Fisher Scientific, USA, Waltham, Massachusetts), in the range of 4000-400 cm^{-1}. Scanning electron microscope LEO SUPRA 50VP (Carl Zeiss, Germany) was used to study the microstructure of obtained ceramic. The samples were coated with a 15 nm layer of chromium (Quorum Technologies QT-150T ES, Britain) to prevent charging of samples. EDX microanalysis was carried out on LEO SUPRA 50VP scanning electron microscope (Carl Zeiss, Germany) equipped with an INCA Energy 300 energy dispersive spectrometer (Oxford Instruments, UK). The accelerating voltage was 21 kV. To measure the relative density of the samples, the mass and geometric dimensions were measured using a micrometer (width, height, thickness) of ceramics before and after firing.

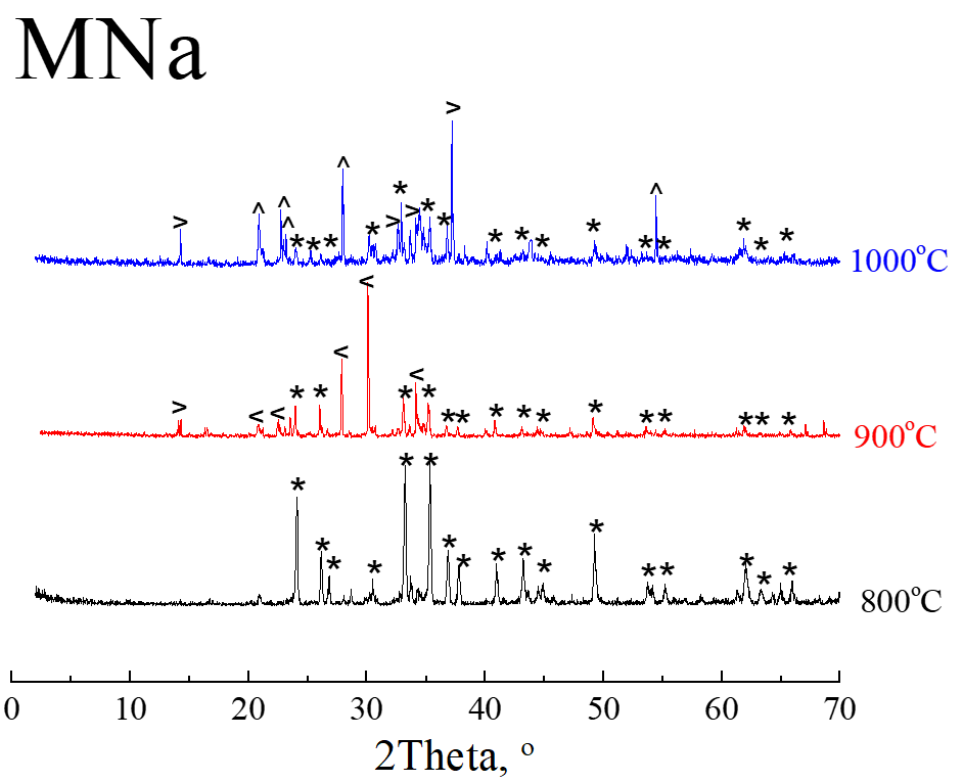

Figure S1 Diffractograms of ceramic samples based on $MgNaPO_4$ sintered at various temperatures. * marked peaks attributed to $MgNaPO_4$ (ICDD card 32-1119), ^ - Na_3PO_4 (ICDD card 32-1442), > - $Mg_4Na(PO_4)_3$ (ICDD card 34-671), < - $MgNaPO_4$ (ICDD card 32-1121),.

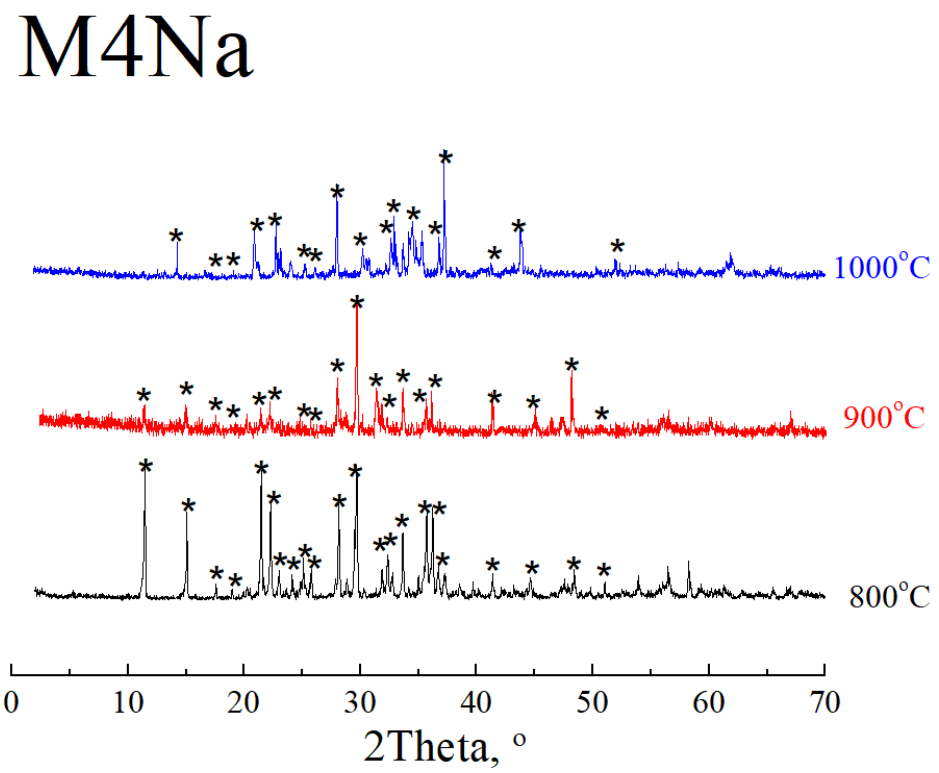

Figure S2 Diffractograms of ceramic samples based on $Mg_4Na(PO_4)_3$ sintered at various temperatures. * marked peaks attributed to $Mg_4Na(PO_4)_3$ (ICDD card 34-671).

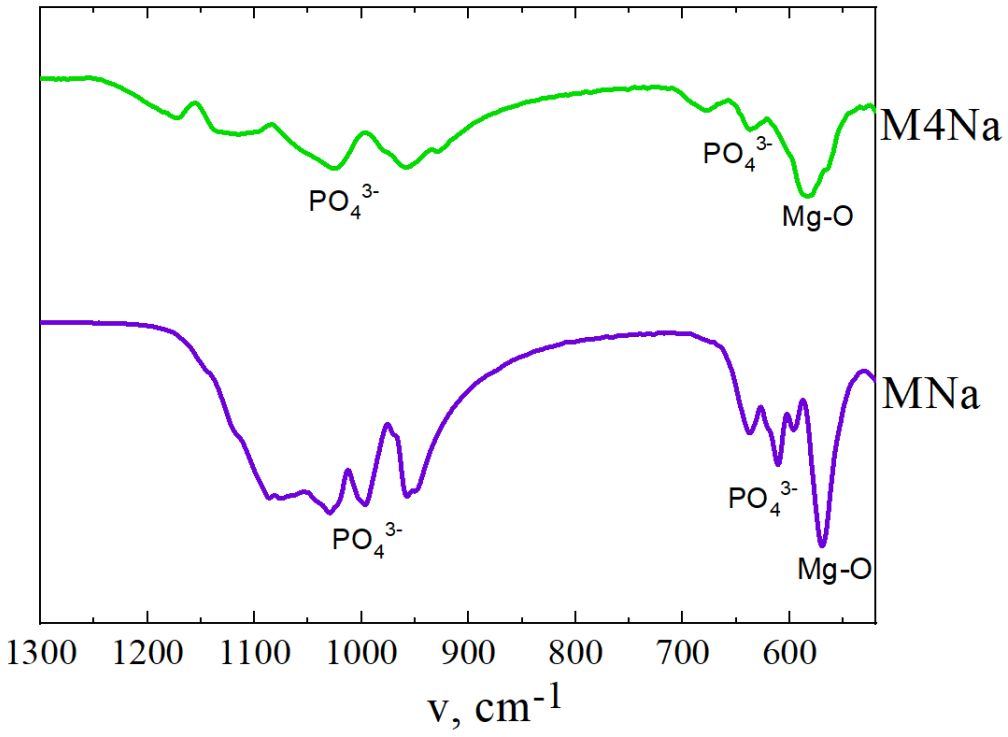

Figure S3 FT-IR spectra of powders of $MgNaPO_4$ and $Mg_4Na(PO_4)_3$.