[MS24-P27] Old materials in the nanoworld: cases of shape and dimensionality control

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The versatility of phosphate materials concerning microscopic dimensionality and nanostructural shape is shown throughout two recent examples. Trialkylammonium-titanium(IV) phosphate nanomaterials with different shape, size and crystallinity are reported. These nanomaterials have been prepared by using microemulsion-mediated solvothermal methods. Both morphology and structure are controllable, and this simple synthesis-route will be used to prepare whisker-, rod-, platelet-like and tubular hybrid nanomaterials [1,2]. It was found that the reaction temperature, concentration of reagents and molar ratio of the reactants have significant effect on the structure, shape and size of the nanocrystals formed. Experimental results indicate that the synthesis of TAA/TiP metastable phases can be controlled, and we are making efforts in this way. $NH_4Zn_2(PO_4)(HPO_4)$ (**1**) two-dimensional zinc phosphate, *via* ammonia vapor interaction at room temperature, transform to $NH_4Zn(NH_3)$ PO4 (**2**) one-dimensional novel compound. By partial ammonia desorption (outgassing at room temperature or by soft thermal treatment) **2** transform to NH_4ZnPO_4 (**3**) with a well-known ABW-zeolitic topology. The crystal structure of **1** was refined using single-crystal neutron diffraction data, while that the crystal structure of **2** was solved *ab initio* using synchrotron powder X-ray diffraction. The structure of three compounds include extra-framework ammonium cations to the 4-fold coordinated zinc (ZnO_4 tetrahedra for **1** and **3**, and ZnO_3N tetrahedra for **2**) and phosphorus (PO_4 tetrahedra) with bi-, mono-or three-dimensional linkages, respectively for **1**, **2** or **3**. The mono-dimensional order occurs with the formation of a unusual link between ammonia molecules and zinc atoms. In our knowledge, the process described here constitutes the first example of dimensionality change in solid phase promoted by a solid-gas interaction at room temperature [3-6].

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