Borophosphate: Crystal Chemistry, Systematic and Synthesis

Elena L. Belokoneva, Olga V. Dimitrova, *Moscow State University, Geological faculty, 119992 GSP2 Moscow, Leninskije Gory 1, Russia.* E-mail: elbel@geol.msu.ru

Borophosphate synthesis and characterization has been started only ~10 years ago. Significant contribution including first approach to structural chemistry [1] has been made in Germany. In our investigation among new borophosphates, $In[BP_2O_8].0,8H_2O$ relates to $M^I M^{II}(H_2O)_2[BP_2O_8].H_2O$ [1] and $Fe(H_2O)_2[BP_2O_8].H_2O$ [2], has framework of In, B and P tetrahedra and most successful zeolite properties.

New systematic [3] uses B:P ratio (as in [1]) and besides topology and symmetry analysis of structural building blocks. When B:P>1, B polyhedra in complex anion form structural blocks and its combination typical for the borates with the P tetrahedron in outside "decorating" (of high charge reason) or connecting role. When B:P~1, low degree of condensation B and P polyhedra is typical with the borate anions topology and the same P tetrahedra role. When B:P<1 (most of the compounds) structural block of equal topology and local symmetry *–4* with the central B tetrahedron and four apical P tetrahedra may be detected in all the structures. Block can be full or deficient protonated. The condensation degree determines the systematic with the ortho, soro, chain, ribbon, layer or framework borophosphate anion. The higher pH is at hydrothermal synthesis, the higher is the condensation degree of blocks; low pH (acid condition) assists protonation of blocks. Topology and symmetry analysis demonstrates that in despite of the diversity, borophosphate form a single class of compounds. This work was supported by RFBS, project 02-03-33316.

[1] Kniep R., Engelhard H., Hauf C., *Chem. Mater,* 1998, **10,** 2930. [2] Yilmaz A., Bu X., Kizilyalli M., Stuky G.D., *Chem. Mater,* 2000, **12,** 3243. [3] Ruchkina A., Belokoneva E.L., *Russ. J. Inorg. Chem,* 2003*,* **48,** 1812.

Keywords: borophosphate, crystal chemistry and systematic, synthesis