

Review
of the Dissertation of Elena S. Zhitova «Crystal Chemistry of Natural Layered Double Hydroxides» submitted for the degree of Doctor of Philosophy in Geology at the St. Petersburg State University

The dissertation of Elena Zhitova contains results of the first detailed crystal chemical study of rare mineral quintinite from the Kovdor alkaline massif (Kola peninsula, Russia) and the Bazhenovo ultrabasic massif (the Middle Urals, Russia).

Selection of quintinite as the object of research is due to the fact that quintinite belongs to the layered double hydroxides (LDHs), a large class of natural and synthetic compounds. To date, 44 minerals have been described as natural examples of LDH phases; they are commonly known as the 'hydrotalcites' or 'hydrotalcite group' of minerals. Scientifically, these minerals are interesting as indicators of temperature and chemical composition of hydrothermal solutions from which they form. Also, LDHs have become important to industry, and have found uses as catalysts, drug delivery media, and sequestering agents for organic polymers and etc. So, Elena S. Zhitova's dissertation has the particular interest from both scientific and public points of view.

The dissertation consists of 77 pages, including 5 published articles, one of which is primary authorships for the candidate. Elena S. Zhitova is listed as third author on the remaining 4 articles. Three articles are published in "Mineralogical Magazine", international journal of high standing and are closely related in topic and study area. One article published as a chapter in the monograph "Minerals as Advanced Materials" (Springer-Verlag, Berlin-Heidelberg) and the fifth article appears in "Bulletin of Saint-Petersburg State University". All articles represent a substantial contribution to the field of crystal chemistry of the layered double hydroxides, and mineralogy in general.

It should be noted that Elena Zhitova discovered three completely new and previously unknown polytypic modifications (*2H-3c*, *1M*, *2H*). I have some questions about the implication of this data for understanding the mineral's formation in different geodynamic situations.

Can these polytypes provide information about the conditions under which the layered double hydroxides form?

What are the differences between chemical composition, physical properties and crystal structure (or typomorphic properties) of quintinite from Kovdor alkaline massif, and Bazhenov ultrabasic complex?

I should say that the most of data are received by Elena Zhitova herself or with her active participation. The results obtained are valid, most of them have been published in peer-reviewed international journals.

Finally, I can conclude that the dissertation of the Dissertation of Elena S. Zhitova «Crystal Chemistry of Natural Layered Double Hydroxides» complies with the international standard for PhD dissertations in the corresponding field.

Prof. Dr. Vladimir G. Krivovichev
Department of Mineralogy
Faculty of Geology
Saint-Petersburg State University, Russia