

Editorial

Foreword to the thematic set on 'Uranium: mineralogy, crystallography and geochemistry. A special issue honoring the 85th birthday of Jiří Čejka'

The beauty of uranium minerals and compounds, especially those containing U^{6+} in the form of uranyl ion, has been known to mineralogists, chemists and crystallographers since the find of the first "uranium mica" – torbernite (Born 1772), followed by the discovery of uranium by the German chemist Martin Heinrich Klaproth (Klaproth 1789), when he isolated yellow powder of UO_3 from Saxonian pitchblende. Deeper crystallographic, chemical and physical investigations of uranium and its compounds started with increasing demand for uranium as the source of energy – either for military or civil use – after the Second World War. These early studies were primarily focused on origin, genesis and primary physico-chemical properties of U minerals, thus the areas connected to the occurrence and prospection of U deposits and related issues. Nowadays, the research is more connected with issues related to the environment and its protection – contaminations, sorption barriers etc., or safety and technological research. Uranium and its crystal chemistry became Jiří Čejka's favorite topic since his early career as a chemist in Reagencia state enterprise after his release from the communist prison.

Ing. Jiří Čejka, DrSc. was born on 2nd September 1929 in Roudnice nad Labem in Bohemia. After the high-school (1948) he studied at the Institute of Chemical Technology in Prague. However, he was fired based on political reasons, sentenced according to the special law that was used by the communist government against people who disagreed with the new ruling, and was imprisoned. In prison he served as a miner in the coal mine Kohinoor in Libkovice (northern Bohemia). After release from prison he did several distinct jobs, as chemist in Reagencia state enterprise, Kralupy nad Vltavou (1954–1959) and in Glazura factory in Roudnice nad Labem (1959–1972). In 1961 he was allowed to finish studies at the Institute of Chemical Technology in Prague and in 1970 he defended dissertation and obtained degree CSc. (Ph.D. equivalent). Since 1972, Jiří was employed in one of the departments of the National Museum in Prague. Since 1991, he was the director of the Museum of the Natural History (National Museum in Prague) until his retirement in 2001. Jiří was awarded by DrSc. degree (DSci. equivalent) in geological sciences in 1994. Jiří is married (since 1958); with his charming wife Marie they brought up two sons, Jiří (Jr.) and Jan, both renowned scientists.

Jiří devoted his whole life to science and scouting; he is still active in both areas; paradoxically, maybe more active than before his retirement. In 2011, Jiří (scouting name "Péguy") was awarded for his scouting activities and human qualities by the highest scouting award in Czech Republic – Silver Wolf Award (Řád stříbrného vlka). It is also Jiří's credit that Czech uranium mineralogy and mineral spectroscopy has a good reputation abroad and Jiří's contribution to the spectroscopy and thermal analysis of uranium minerals and compounds is much and widely recognized. Jiří is a coauthor of the descriptions of fifteen new mineral species – jáchymovite (1996), vajdakite (2002), phosphowal-purgite (2004), pseudojohannite (2006), šreinite (2007), metarauchite (2010), běhounekite and sejkoraite-(Y) (2011), adolfpateraitite (2012), leydetite, meisserite, štěpíte, švenekite and vysokýite (2013), mathesiusite (2014). An interesting uranyl carbonate from Jáchymov was named *čejkaite* in his honor (Ondruš et al. 2003).

It is the 85th birthday anniversary of Jiří this year that motivated us to collect papers on the uranium-related topics and compile this Special Issue of the *Journal of Geosciences*. It presents six contributions focused on mineralogy, geochemistry and crystal chemistry of uranium and uranyl minerals.

In the last two decades a significant step forward has been made in the knowledge of crystal chemistry and crystallography of uranium and also in the knowledge of weathering processes. The first review paper by *Plášil* aims to summarize the recent advances in crystal chemistry, geochemistry and thermodynamics of uranium minerals and compounds. It also discusses several controversial issues and points out a few unclosed gaps for further research.

All other papers focus on crystal-chemical aspects of the new uranyl minerals and synthetic compounds. Among them, *Krivovichev* reports on the first uranyl molybdosulfate with interesting modular structure, refined from single-crystal X-ray diffraction data. He also discusses the relevance and possible links to natural minerals.

Paper by *Gurzhij et al.* describes the role of potassium in the crystal structures of two newly-synthesised uranyl selenate compounds. The role of potassium, which causes curvatures of the uranyl sulfate layers, is discussed also with regard to the uranium nanostructures.

Contribution of *Krivovichev and Burns* focuses on the structure of the novel and very interesting uranyl sulfate, which is containing cobalt. The structure sheet of this compound is built up from the modular units and it is a nice example of combinatorial possibilities (and possible pathways) while considering sheet structures from topological point of view.

Paper by *Plášil et al.* provides complete description of a new mineral species, bluelizardite, a novel uranyl sulfate from Blue Lizard mine in Utah (USA), containing chlorine and sodium. The relations between crystal chemistry of bluelizardite and its occurrence and mineral association are discussed from the point of view of the bond-valence theory.

Cooper et al. focus not directly on the topic of uranium, but to the much related issue that is the crystal chemistry of vanadium oxysalts. Vanadium is commonly associated with uranium, namely in case of sedimentary uranium deposits. Here the authors determined very complex crystal structure of the vanadate mineral metahewettite from U–V deposit Hodzha-Rushnai-Mazar in southern Kirgizia.

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References

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Jiří and Marie standing at the 3rd courtyard of the Prague castle. April 2011. Photo by Z. Navrátil.

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[Guest Editors]