

## Fosfouranylit z oxidačnej zóny žilnej kremenno-apatitovo-REE-U mineralizácie v Majerskej doline pri Čučme (Slovenské rudohorie, gemerikum)

Phosphuranylite from the oxidation zone of the vein quartz-apatite-REE-U mineralization at Majerská Valley near Čučma (Slovenské Rudohorie Mts., Gemeric Unit)

ŠTEFAN FERENC<sup>1)\*</sup>, ADRIÁN BIROŇ<sup>2)</sup>, JIŘÍ SEJKORA<sup>3)</sup> A MARTINA SÝKOROVÁ<sup>4)</sup>

<sup>1)</sup>Katedra geografie a geológie, Fakulta prírodných vied, Univerzita Mateja Bela, Tajovského 40, 974 01 Banská Bystrica, Slovenská republika; \*e-mail: stefan.ferenc@umb.sk

<sup>2)</sup>Ústav vied o Zemi, Slovenská Akadémia Vied, Ďumbierska 1, 974 11 Banská Bystrica, Slovenská republika

<sup>3)</sup>Mineralogicko-petrologické oddelení, Národní muzeum, Cirkusová 1740, 193 00 Praha 9, Česká republika

<sup>4)</sup>Katedra chémie, Fakulta prírodných vied, Univerzita Mateja Bela, Tajovského 40, 974 01 Banská Bystrica, Slovenská republika

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### Abstract

Phosphuranylite was found in quartz vein fragment near the Lower Clement gallery, in Majerská Valley, about 3.5 km to the NE from Čučma village (Rožňava district). Quartz-apatite veins with REE-U mineralization here are localized mainly in Silurian metarhyolites and their volcanoclastics of the Bystrý Potok Formation (Gemic Unit). A rich yellow phosphuranylite form filling of cavities (up to 2 cm) and cracks in the quartz gangue, in spatial association with brannerite. Its colloform aggregates have a boxwork microtexture. The average crystallochemical formula of phosphuranylite is:  $K_{1.16}(Ca_{1.15}Ba_{0.01}Fe_{0.02}Pb_{0.09}Al_{0.03}Si_{1.31})(H_3O)_{2.00}(UO_2)_{6.53}O_4[(PO_4)_{3.81}(SiO_4)_{0.18}(AsO_4)_{0.01}S_{4.00}] \cdot 8H_2O$ . Its main diffraction maxima  $d(l)$  are 7.922(100), 5.839(36), 3.962(40), 3.079(55), 2.872(54), unit cell parameters:  $a = 15.860(1) \text{ \AA}$ ,  $b = 13.683(1) \text{ \AA}$ ,  $c = 17.308(1) \text{ \AA}$ ,  $V = 3756(1) \text{ \AA}^3$ . Infrared vibrational spectra of studied phosphuranylite show the  $\nu_4$  ( $PO_4$ )<sup>3-</sup> triply degenerate bending vibration at 491  $cm^{-1}$ ; water molecule libration modes at 595; 671; 692; 777 and 796  $cm^{-1}$ ; the  $\nu_3$  ( $UO_2$ )<sup>2+</sup> antisymmetric stretching vibration at 908  $cm^{-1}$ ; the  $\nu_3$  ( $PO_4$ )<sup>3-</sup> triply degenerate antisymmetric stretching vibration at 1002; 1044; 1084  $cm^{-1}$ ; the  $\delta$   $H_2O$  bending vibration at 1627  $cm^{-1}$  and  $\nu$  OH stretching vibrations at 3228; 3350 and 3405  $cm^{-1}$ . Weak bands at 2886 and 2837  $cm^{-1}$  may be assigned to organic impurities. The calculated U-O bond length 1.78  $\text{\AA}$  corresponds to short U-O bonds in phosphuranylite. In mineral structure are present weak hydrogen bonds  $d(H \cdots O)$  1.81 to 1.93  $\text{\AA}$ . Any assignment of infrared bands to  $H_3O^+$  ions remains open. Botryoidal uraninite aggregates were entirely replaced by uranyl-oxide hydroxy-hydrates. These were subsequently replaced by phosphuranylite under the slightly acidic to the slightly alkaline (nearly neutral) environment.

**Key words:** phosphuranylite, uranium mineralization, supergene zone, uraninite oxidation, uranyl minerals, Gemic Unit, Western Carpathians

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