**Perlite deposits of the Central Slovakia Volcanic Field (Western Carpathians): Geology and properties**

**Electronic supplement 1: Methodology**

Field work included a detailed geological mapping of both perlite deposits and their immediate surroundings, a careful study of lithological and volcanological aspects, lithological and photographic documentation at sampling sites (El. Suppl. 2) and collection of representative samples for laboratory investigation (El. Suppl. 3, including WGS 84 coordinates).

Microscopic study of polished sections in transmitted light was performed using an Olympus BX-51 microscope (Department of Economic Geology of the Comenius University, Bratislava). Porosity was also studied using microprobe BSE images (CAMECA SX100 probe at the Dionýz Štúr State Geological Institute), N2 adsorption and X-ray computed microtomography (Varga et al. 2019). The scanning electron microscopy (SEM) images were performed at the Earth Science Institute of the Slovak Academy of Sciences in Banská Bystrica on the instruments JEOL JSM-6390 LV.

The chemical composition of perlite was established by ICP-ES and ICP-MS methods in the laboratory Bureau Veritas Minerals, Vancouver, Canada (El. Suppl. 6). To eliminate the influence of perlitic water content on concentrations of elements and to enable comparison with analyses of rhyolites we have used analyses recalculated to 100 % dry (El. Suppl. 6) for construction of graphs.

Electron-microprobe analyses (EMPA) were carried out at the Dionýz Štúr State Geological Institute on the CAMECA SX100 probe (El. Suppl. 7). An acceleration voltage of 15 kV, a sample current of 20 nA with a beam diameter between 3 to 10 µm were used for analyses. To minimize losses of Na and other elements due to volatilization during analysis, glass was measured at two steps, Na being measured first with a sample current 3 nA and the rest of elements at the current 10 nA. Measurements were carried out with the following standards: Si Kα - orthoclase, wollastonite; Ti Kα - TiO2; Al Kα - Al2O3, orthoclase; Cr Kα - Cr; Fe Kα - fayalite; Mn Kα - rhodonite; Mg Kα - forsterite; Ca Kα - apatite, wollastonite; Ni Kα - Ni; Zn Kα - willemite; NaKα - plagioclase; K Kα orthoclase; PKα - apatite; S Kα; Ba Lα - barite; Sr Lα - SrTiO3; F Kα - CaF2; Cl Kα - NaCl.

For X-ray diffraction one gram of ground bulk rock sample (fraction less than 0.16 mm) was mixed with 0.250 g Al2O3 (internal standard with nominal grain size 3.5 μm; AL-OX-03-P, American Elements Corp). The mixture was mixed with 4 ml of denatured alcohol and ground for 5 min using an McCrone micronizing mill (ZrO stabilized with Y was used as the grinding element; Środoń et al. 2001; Eberl 2003; Omotoso and Eberl 2009). The randomly oriented sample was X-rayed from 5 to 65° two-theta using a diffractometer Bruker D8 ADVANCE DAVINCI at the Earth Science Institute of the Slovak Academy of Sciences in Banská Bystrica (Slovakia). The RockJock11 (Eberl 2003) was used for quantitative analysis. Relative errors of measurement of common minerals are estimated at ± 4%. Results of XRD analyses of individual samples are in the El. Suppl. 5.

Clay fraction (< 2 μm) was separated by gravity sedimentation according to Stokes' law to identify the presence of clay minerals. Orientated powder samples were prepared at glass slides. The samples were analyzed in an air-dried state and saturated with ethylene glycol overnight at 70°C (EG) using a Philips PW 1710 diffractometer (CuKα radiation, 35 kV, size of divergence slit 1º and receiving slit 0.2 mm, 20 mA, step size 0.2°, 1 s per step; measured interval was 2 – 50° 2 theta).

Loss on ignition (LOI) was measured in a muffle furnace at 950°C for four hours using 2 g of powdered sample (< 0.16 mm). LOI was obtained by reweighing of two parallel samples and relative error of measurements was ± 2 %. Before ignition samples were dried at 105°C during 18 hours. Results are in the El. Suppl. 9.

A loss of perlite water during thermal treatment was studied by thermogravimetric (TG) and differential thermal analyses (DTA) and by LOI at different temperatures and time intervals (Varga et al. 2019).

**References**

Eberl D.D. 2003. User’s guide to RockJock – a program for determining quantitative mineralogy from powder X-ray diffraction data. U.S Geological Survey Open-File Report 2003-78.47.

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