

CHARACTERISTICS OF POST-OROGENIC PERMIAN ACID MAGMATITES IN THE WESTERN CARPATHIAN AREA (SLOVAKIA)

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Small bodies of Permian granites and rhyolites to dacites occur in all main tectonic units of the Central Western Carpathians, even in Lower Paleozoic crystalline complexes and Carboniferous–Permian molasse sediments.

Unlike orogenic mainly Carboniferous calc–alkaline I– and S–type tonalites, granodiorites to granites without volcanic members and with VAG–affinity, the Permian acid magmatites record geochemical and mineralogical features of (sub) alkaline A–type character which indicates their post-orogenic origin.

Permian granitic rocks occur as intrusions, tectonic remnants or only blocks and pebbles in younger turbidite sediments (the Upohlav type), and they can be divided into two groups:

The first group of granites (the Turčok, Upohlav, Velence, Hrončok, Rochovce ?) is characterised by higher contents of K, Zr, REE, Y, Zn, Ga/Al, (partly also of Rb, Nb, Th and F) and on the contrary by lower Al, Ca, Mg, P, Ba, Li, B, Sn, often with extremely low Sr and V. Biotite leucogranites often with porphyric pink K–feldspar prevail over granite porphyries. Locally, the stockwork W–Mo or vein Mo–mineralization evolved (Rochovce resp. Velence). The zircon typology with both high alkalinity (I.A) and temperature (I.T) indices (700;>600 – Turčok, Upohlav and Velence) or high I.A and lower I.T (700; 250–500 – Hrončok and Rochovce) indicates alkaline–rich magma conditions and high (>800 °C) to lower (700±50 °C) temperatures. The accessory mineral assemblage magnetite + allanite ± sphene together with Fe³⁺–rich biotite suggest the high oxygen fugacity of Turčok, Upohlav and Rochovce magmas, although presence of monazite and ilmenite in Hrončok granite and partially in some places in the Velence granites indicate lower fO₂ values. The U–Pb and Rb–Sr dating of these granites gave ages around 290–250 Ma.

The second group of Permian granitic rocks occurs only in the Gemeric Unit. They are biotite and two–mica tin–bearing leucogranites, less granite porphyries with high K, Li, Rb, B, Sn, W, Nb, U, Ga/Al, F and lower Ti, Al, Ca, Mg, Zr, REE, Y and Th contents. The greisen or albitite–like Sn, W, (Li, Nb, F, B, etc.) ore mineralization occurs in granite copulas (loc. Hnilec, Dlhá dolina). The zircon typology indicates only moderate alkalinity and temperature indices (both 350–450). Absence or scarcity of Fe³⁺–rich phases and presence of almandine–spessartite garnet, sometimes with ilmenite and monazite are evidences of low oxygen fugacity. Tourmaline, cassiterite with inclusions of Ti–Nb–Ta oxide minerals, fluorite, topaz and wolframite are characteristic accessory minerals especially for apogranites, greisens and albitites. The Rb–Sr isotope determinations of common unaltered granites indicate mainly a Lower Permian age (around 280 Ma), however greisen–like varieties gave generally younger ages (less than 250 Ma).

Permian acid volcanic rocks of rhyolitic to dacitic composition with their ignimbrites and tuffs record generally a similar geochemical pattern as their plutonic equivalents. They contain zircon with high alkalinity and temperature indices (both over 500–600). Volcanic rocks of these features occur mainly in the Gemeric, less Tatric and Zemplinic Units, in addition to pebbles in the Pieniny Klippen Belt flysch (the Upohlav type). Slightly different character is indicated by the Harnobis dacite ignimbrites of the Veporic Unit with calc–alkaline trace element and zircon characteristics. Although the isotope dating is missing up to now, based on geological position the age of acid volcanics varies from Lower to Upper Permian and the Telgárt rhyolite with relatively strong alkaline character occurs as a part of Triassic Vernár Sequence of the Silica Unit.

It could be concluded that Permian acid plutonism and volcanism in the Western Carpathian area bears many features typical of post–orogenic molasse magmatism with continental within–plate and non–collisional character which originated on huge strike–slip and linear extensional fault systems. Generally, Permian acid magmatites show a moderate to strong (sub) alkaline A–type trend and only rarely exhibit calc–alkaline affinity. Thus, Permian granites and rhyolites in studied area rank among typical examples of European post–Variscan alkaline magmatic activity.