Enigmatic corundum-rich rock from the central Tauern Window: metabauxite in the Habach Group?

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A 60 kg block of a dark grey, hard, almost structureless sulphide-rich rock was found in the river bed of the Obersulzbach Valley near Hopffeldboden, Pinzgau, Venediger Alps (Salzburg, Austria). In this area, the prevalent Variscan granite gneisses of the Central Gneiss Supersuite are intercalated with metavolcanics (amphibolite, chlorite schist) and metasedimentary rocks (micaschist, graphitic phyllite) of likely pre-Variscan origin. They are attributed to the “Schieferhülle Nordrahmen” (“Lower Schist Cover”), correlated to the Habach Group. In this contribution, we provide a mineralogical and geochemical characterization of this unusual rock and speculate on its origin. Microscopic examination reveals abundant magnetite, hematite, pyrite and some chalcopyrite in a very finegrained non-foliated matrix, in which rare white mica flakes and aggregates could be unequivocally identified. Under the SEM, the fine matrix turned out to consist mainly of anhedral corundum of 30–50 µm grain size intergrown with green-blue pleochroic Fe-rich chloritoid (#Mg = 15–26) and less abundant light green chlorite with #Mg ranging from 40–50. White mica aggregates consist of intergrown margarite and paragonite and are often surrounded by large chloritoid crystals. Apatite is present throughout the rock, although grain size and abundance vary. Accessory phases include diaspore, epidote/allanite, zircon, and Ca-rich monazite. Oxide minerals mainly consist of magnetite and ilmenohematite. Uraninite and Nb-rich rutile (4–6 wt.-% Nb_2O_5) are subordinate. Sulphides postdate the oxide-silicate assemblage and mainly consist of pyrite and chalcopyrite, with rare molybdenite. Chemical analysis by wavelength-dispersive X-ray fluorescence spectroscopy on a fused disc reveals high contents of Al_2O_3 (51 wt.-%), Fe_2O_3 (29 wt.-%) und S (9.7 wt.-%), low SiO_2 (3.8 wt.-%), CaO (1.8 wt.-%), MgO (0.7 wt.-%), and K_2O and Na_2O. TiO_2 (3.9 wt.-%) and P_2O_5 (1.2 wt.-%) are severely enriched compared to typical crustal rocks. Among the trace elements, high contents of Zr, V, Nb, Cu and Ga are noteworthy, along with low Cr, Ni, Y and REE. The chemical composition resembles Si-depleted, Fe-rich bauxite. Compared to other metabauxites, the P content is extraordinarily high; abundant apatite in the rock appears to postdate the corundum assemblage. Apart from S, Fe, Cu and P, levels of minor and trace elements are within the ranges expected for bauxite. Trace elements concentrations, especially low Ni-Cr contents favour an origin from acidic precursor rocks. Chemical composition and mineralogy both strongly argue in favour of a bauxitic origin of the sample. The lack of marble in the Habach Group points to derivation from laterite bauxite or silicate bauxite, and low-Cr-Ni contents exclude an origin of the detritus from ophiolite rocks, but rather point to an acidic granitic source. Two options are to be discussed: (1) post-Variscan weathering of Variscan gneisses, most likely in the Lower Triassic, or (2) pre-Variscan weathering of older crustal rocks. Although metamorphosed paleoweathering horizons are known from several locations in the Tauern Window and the Austroalpine nappes, the corundum-rich boulder described in this contribution remains enigmatic and requires further field and laboratory studies.