SECONDARY MINERALS IN THE LOWER PERMIAN FILIPOWICE TUFF: A RECORD OF THE LIASSIC HYDROTHERMAL EVENT

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The Filipowice tuff formed during Early Permian volcanic activity crops out in the Krzeszowice area (cca. 35 km West from Kraków). Lower Permian sedimentary, volcanic and pyroclastic rocks occur in the Kraków–Upper Silesia Rotliegend basin extended along NE margin of the Upper Silesia Coal Basin. The tuff is a fine-grained pinkish or violet-pinkish porous rock with abundant biotite grains (up to 8 mm in diameter) and lithic clasts of various size and composition (volcanic and sedimentary rocks).

The Filipowice tuff is composed of K-feldspar (with sanidine domination determined using XRD), kaolinite, mica minerals and quartz. In < 0.2 μm fraction the illite–kaolinite ratio is significantly higher than in 0.2–2.0 μm fraction. Illite-smectite minerals are present in both fractions. Apatite microphenocrysts are relatively abundant. K-feldspar in matrix occurs both as anhedral and euhedral rhombohedral crystals (adularia habit). Authigenic hairy illite or illite-smectite occur commonly on surfaces of K-feldspar rhombohedra. K-Ar age determined on illite dominated < 0.2 μm fraction corresponds to the Early Jurassic (199.3[±0.7] Ma). Hematite flake aggregates can also be present on K-feldspar rhombohedra surfaces or partly intergrown with rhombohedra. K-feldspar phenocrysts are strongly kaolinised (kaolinite partly fills voids in phenocrysts). Kaolinite occurs also on rhombohedral K-feldspar, in rock matrix or on biotite. Mafic minerals phenocrysts are partly or completely replaced by Fe- or Fe-Ti-oxides. Secondary barite aggregates are scarce.

Intense K-rich fluids related alteration of the Filipowice tuff is suggested by high K_2O content (8–12wt% according to Kordek and Gruca, 1980; Madeja, 1986), high K_2O–Na_2O ratio (from 10 to 30), and great abundance of authigenic adularia-type K-feldspar. Adularisation of rhyodacite from the Krzeszowice area was described by Słaby (1990). Presence of K-rich volcanic rocks in this area is wide-spread and their metasomatic ("kalification") or primary magmatic origin is discussed by numerous authors (cf. Czerny and Muszyński, 2000 and references cited therein).

Smolak and Michalik (2002) suggested that K-alteration of the Filipowice tuff was related to post-magmatic K-rich fluids or to downward percolation of alkaline marine water from salinary environment developed on elevated areas during Early Muschelkalk (Brniak, 2000). Age determination of illite formed during alteration of tuff indicates that process corresponds to the Early–Middle Jurassic hydrothermal event noted in whole Europe. Hydrothermal activity resulted in diagenetic illite growth in various sedimentary basins in Western and Central Europe (Clauer et al., 1996; Liewig et al., 1987; Michalik, 2001; Zwingmann et al., 1999) and alteration of Late Carboniferous-Early Permian volcanic rocks in Central Europe (Goll et al., 2003; Jacobs and Breitkreutz, 2003; Pękala and Michalik, 2003). The age of alteration of the Filipowice tuff roughly corresponds to the Mesozoic thermal event noted in NE part of the Upper Silesia Coal Basin (160–170 Ma; Środoń et al., 2003)

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