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Abstract

The following thesis is aimed at the magmatic-hydrothermal evolution of trachyandesites from Świerki and Głuszyca Górna, as well as trachybasalts from Borówno (the Intra-Sudetic Basin, Lower Silesia, Poland) based on detailed mineralogical, geochemical, and geochronological data. These rocks occur as shallow-level subvolcanic magmatic bodies that preserved the record of widespread post-orogenic volcanism in Central Europe during the early-Permian period (ca. 290 Ma). Despite the continental nature of volcanic rocks and lack of seawater-magma interactions, spilitic assemblages (i.e. chlorite, albite, and celadonite) have been ubiquitously developed within the uppermost regions of the bodies. Chlorite thermometry yielded that the alterations occurred down below ca. 170 ºC. The albitization of primary plagioclase (i.e. andesine-labradorite) was not only aided by a dissolution-reprecipitation mechanism, but also enhanced by crystallographic features (i.e. twinning or cleavage planes and intergranular fractures that acted as fluid pathways) of the primary plagioclase. Meanwhile, the reconstructed ,,spilite reaction" accounts for the limited mobility of Al^{3+} during the mineral-replacement reactions, whilst the secondary albite exhibits weak to dark-brown cathodoluminescence (CL) and pure chemical composition (Ab~99 mol.%). Na^{+} and Si^{4+}, both necessary during the incipient albitization, could be derived from the alteration of pre-existing Na-bearing mafic phases (i.e. aegirine and fluoro-edenite), which have been recognized in poorly-altered samples. Meanwhile, the albitization has only slightly affected the primary (magmatic) alkali-feldspars where the positive correlation of Ti (and Ba) contents with the intensity of blue cathodoluminescence (CL) has been additionally reported. Apatite fission-track (AFT) ages of trachyandesites from Głuszyca Górna range from 182 to 161 Ma, and reflect the timing of secondary fluid flow that could trigger the ubiquitous spilitization. The obtained AFT ages are notably younger than the Cenomanian transgression (ca. 85 Ma) and hence remain consistent with the presence of ,,Sudetic Islands" in the Intra-Sudetic Basin. Progressive spilitization of both trachyandesites and trachybasalts has induced the increase of Cs contents, followed by the decrease of Sr contents, owing to the plagioclase albitization and crystallization of hydrous phases (e.g. chlorite and celadonite), respectively. Chondrite-normalized REE patterns remained sub-parallel in both weakly and strongly spilitized samples. Geochemical hallmarks for trachybasalts (e.g. elevated Nb/La and Ta/La ratios) suggest that the mantle source could be metasomatized by asthenospheric-derived OIB-type melts. Conversely, the development of negative Nb–Ta–Ti–P anomalies in mantle-normalized diagrams of trachyandesites, coupled with enrichment in Zr and Hf, can be linked to the crustal contamination and/or fractional crystallization of mafic phases and fluorapatite. Trachybasalts from Borówno contain silica mineralization that involves polycentric moss agates and vein agates. The former originated from mixing between meteoric waters and magmatic-related fluids related to syn- and/or post-volcanic alterations (i.e. spilitization) of host volcanic rocks. Otherwise, vein agates comprise sulphide mineralization (e.g. pyrite and chalcopyrite), whilst their formation was linked to the magmatic-related fluids only, but could also occur during boiling-related conditions. Both agate types reveal a pronounced (age-related) textural maturity, as shown by e.g. the presence of jigsaw puzzle (mosaic) quartz and a relatively large crystallite size $Cs_{(101)}$ exceeding 60 nm.