SECONDARY MINERALS IN THE PIENINY ANDESITES (SOUTH POLAND)

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So-called Pieniny andesites occur in form of dykes in the Pieniny klippen belt and Magura Unit sedimentary rocks. We present here results of mineralogical study of selected fresh-looking samples of andesites collected from the Malinów quarry, the Bryjarka Hill in Szczawnica and from the Wżar Hill. The studied rocks represent basaltic andesites (two samples from Wżar) and andesites (one sample from Wżar and samples from Malinów and Bryjarka) (according to TAS classification; LOI free basis). The studied samples have SiO_2 content ranging between 51.5 and 61.5 wt %. LOI value varies from 1.3 to 3.8 wt%.

Optical microscopy, X-ray diffraction and SEM-EDS methods were applied. Both powdered bulk rock samples and separated <2 μm fractions were analysed using XRD. XRD analyses were performed in air dry conditions, after saturation of the mounts with ethylene glycol and after heating at 550 °C.

Rocks studied are porphyritic with abundant phenocrysts. Phenocryst assemblage is represented by plagioclase (which predominates over mafic phenocrysts in samples from Malinów and Bryjarka), amphiboles, clinopyroxenes (present in higher amount only in samples from Wżar hill) and Fe-Ti oxides.

Plagioclase phenocrysts composition varies from oligoclase to bytovnite (almost pure albite is of secondary origin). Small differences in average plagioclase composition between samples are observed. Plagioclase phenocrysts are zoned. In some samples plagioclase phenocrysts cores are rich in glass inclusions whereas rims are inclusion-free and exhibit euhedral shape. Plagioclases are partly replaced by calcite and chlorite (commonly in samples from Malinów). Amphibole phenocrysts represent magnesian hastingsitic hornblende and magnesian hastingsite (samples from Malinów, Wżar) and ferroan pargasite, ferroan pargasitic hornblende, edenitic hornblende (Wżar) according to the classification of LEAKE (1978). Amfiboles are often altered – replaced completely or partly by chlorite, calcite, Fe-Ti oxides, titanite. Coronas composed of fine-crystalline aggregates of plagioclases, pyroxene, Fe-Ti oxide minerals are commonly developed around amphiboles. Pyroxene phenocrysts are represented by diopside (in Morimoto (1988) classification). Alterations of pyroxene result in formation of chlorite and calcite. Fe-Ti oxides phenocrysts belong to ulvöspinelo-magnestite series. Degree of mafic phenocrysts alteration is higher in samples from Bryjarka and Malinowa in comparison with samples from Wżar.

Rock groundmass contains small crystals of plagioclase and Fe-Ti oxides. K-feldspar often rich in Ba is relatively common. Groundmass of the sample from Bryjarka is almost completely composed of Ba-rich K-feldspar and quartz (probably of secondary origin); Ba-rich feldspars are present also in sample from Malinowa. Ba content in K-feldspar varies from 0.0 to 0.1 at. *pfu*. Rocks with secondary Ba-enriched K-feldspars seem to exhibit more Ba in bulk rock analysis. Calcite fills voids in one sample from Wżar. Fibrous (potassium rich) illite-like mineral as well as aggregates of Mn-Fe oxides of corn-flake morphology around mafic phenocrysts are observed in samples from Wżar.

Smaller than 2 μm fraction separated from andesite samples and studied using XRD method are composed of illite/smectite (and vermiculite/smectite?) and cristobalite (samples from Wżar), chlorite/smectite, smectite, swelling chlorite?, chlorite? (samples from Malinów), chlorite and small amount of illite/smectite (sample from Bryjarka).

Samples with more altered mafic phenocrysts are richer in secondary chlorite, chlorite/smectite and Ba-enriched K-feldspars as compared to samples with less altered mafic phenocrysts (containing illite/smectite (or vermiculite/smectite)).

Andesite samples differ in the proportions of minerals in phenocryst assemblages but the chemical composition of phenocrysts is generally similar. Rocks significantly differ in degree of mafic phenocrysts alteration and composition of secondary minerals. Differences are the result of variable conditions of secondary alteration of rocks induced by different volumes of magmatic bodies and their emplacement in rocks of different lithology and properties.

Reference

LEAKE, B. E. (1978): Mineralogical Magazine, 42: 533–569.