PHONOLITIC AND TRACHYTIC ROCKS IN THE ČESKÉ STŘEDOHOŘÍ MTS., NORTH BOHEMIA: GEOCHEMISTRY AND PETROLOGY

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The České středohoří Mts. is a typical bimodal, mostly Tertiary, alkaline volcanic province. It is associated with the Ohře rift and belongs to the Central European Volcanic Province. Other well-known European rift-related volcanic provinces include the Massif Central (Cantal and Velay) in France, the Upper Rhine Valley, Rhön and Zittau Basin in Germany and the south-western Poland.

The studied data set of 71 samples comprised phonolites *sensu stricto,* sodalite phonolites, alkaline trachytes, trachytes *sensu stricto* and trachytes with sodalite or analcime, as well as trachyandesites. The rocks showed a wide range of modal compositions and different crystallization sequences according to the classification of Shrbený (1965).

The distinct geochemical behaviour of major- and trace elements during magmatic differentiation in the phonolitic and trachytic rocks can be seen best in the SiO_2 vs. P_2O_5 plot or in the primordial mantle-normalized trace-element diagram. A "normal" trachytic differentiation sequence (trachyandesites, sodalite- or analcime-bearing trachytes and trachytes *sensu stricto*) can be distinguished from a completely different "extraordinary" phonolitic sequence (alkaline trachytes, sodalite-phonolites and phonolites *sensu stricto*). Both sequences are products of highly to extremely highly evolved differentiation processes, resulting in a strong depletion in P, Ti, Nb, Ba and Sr as a consequence of apatite, titanomagnetite and feldspars fractionation. The parental magma is believed to have been generated by very low degrees of partial melting of a garnet lherzolite in the upper mantle. The source magma of the České středohoří Volcanic Province was probably of an alkali-basaltic to basanitic composition, with the trachytes and phonolites representing products of its extreme differentiation.

Further constraints on the differentiation processes in these rocks were obtained by a detailed study of a sodalite-bearing phonolite body at the Želenický vrch Hill near Most. In this intrusion, phenocrysts of alkali feldspars and nepheline, clinopyroxenes or their glomerophyric aggregates, sometimes also sphene, apatite or sodalite, are embedded within a fine-grained trachytic matrix of alkali feldspars, nepheline, sodalite and Na-pyroxenes. Titanomagnetite and hainite (Zr-silicate) are typical accessories; analcime and natrolite are of secondary origin. At the first glimpse, the intrusion seems to be homogeneous. Slight zoning in the marginal compared to the more central parts can be attributed to alteration processes.

Variations in mineral chemistry of the main rock-forming minerals are preserved between rims and cores of crystals, as well as in samples from different position within the body (marginal parts, inner parts, and roof of the intrusion). Main indicators were contents of SiO_2, Na_2O, and BaO for alkali feldspars, SiO_2 and Na_2O for nephelines and Na_2O and CaO for clinopyroxenes, respectively. The following compositional ranges were established within the body: the alkali feldspars are represented by Na-sanidines to anorthoclases (Or_{64} Ab_{36} to Or_{31} Ab_{69}) with An < 1. Nephelines range in composition from relatively Si-poor to Si-rich types (Ne_{79} $Ks_{15.5}$ $Q_{5.5}$ to $Ne_{62.2}$ $Ks_{6.7}$ $Q_{31.1}$). Clinopyroxenes as phenocrysts range from aegirine to aegirine–augite (Aeg_{85} $Quad_{15}$ to Aeg_{20} $Quad_{80}$). The fractionation trend within the body is best documented in the clinopyroxenes: from Ca–Na pyroxenes (earlier precipitates, not in equilibrium with the residual magma) through Na–Ca pyroxenes (aegirine–augites) to Na-pyroxenes (aegirines).

Major- and trace-element (including the REE) geochemical data for the phonolitic intrusion point to an advanced stage of rock evolution. Especially the REE indicate crustal influence on the phonolitic magma and provide evidence for its derivation from a primitive basanitic magma source.

More detailed study of mineral- and whole-rock geochemistry (especially REE and isotopic data) is necessary to constrain further the differentiation processes within phonolitic and trachytic magmas and to produce. a comprehensive petrogenetic model for the České středohoří Mts.