MINERALOGICAL IMPLICATIONS IN SYENITES FROM THE DITRĂU ALKALINE MASSIF, ROMANIA

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The Ditrău Alkaline Massif [DAM], situated in the Eastern Carpathians, Romania, is a Mesozoic alkaline igneous complex, which was formed by an extensional tectonic event at the south European passive continental margin. It consists of different rock types from ultramafic, mafic rocks through diorites, granites, nepheline syenites and syenites to dykes (lamprophyres, tinguaites and alkali feldspar syenites). This paper presents new data on the mineralogy of the syenites.

DAM syenites have holocrystalline, hypidiomorphic and medium-grained texture. They are silica-saturated and oversaturated alkaline, miascitic rocks with 59.63–62.41 wt % SiO_2. These rocks are peraluminous (A/CNK = 1.28–1.53, A/NK/ = 1.48–1.70), which is confirmed by the dominance of K-feldspars (microcline, orthoclase) as the main Al phases. Syenites have a relative enrichment in LREE, the $(La/Yb)_N$ values range from 13.8 to 43.1. Some of them display positive Eu anomaly (Eu/Eu* = 1.53–3.81), reflecting the presence of plagioclase ($An_{0.47–16.52}$) and titanite. Syenites show enrichment in Ba, Sr and Zr. The high Ba-content reflects prevalent K-feldspar as a main rock-forming mineral, while Sr and Zr are associated with apatite and zircon, respectively, as abundant accessories in the studied syenites. Additional accessory minerals are magnetite and ilmenite. Secondary minerals are represented by calcite, epidote, muscovite and chlorite.

Mineral chemical analyses were determined by JEOL JXA-733 electron microprobe equipped with WDS and EDS at the Institute for Geological and Geochemical Research, Research Centre for Astronomy and Earth Sciences of Hungarian Academy of Sciences, Budapest.

The main mafic minerals are biotite and subordinate amphibole. Biotites are generally euhedral to anhedral and often chloritised. Some of them are intergrown with other minerals (amphibole, titanite). Inclusions are usually titanite, zircon, rutile and baddeleyite in biotites. They are Fe-rich biotites, annites with Fe/(Fe+Mg) values of 0.5–0.7.

Three types of amphiboles are determined in the DAM syenites. They all have subhedral shape but usually highly shattered and altered. Amphiboles are Ca-amphiboles, pargasite $[Na_{0.8}K_{0.3}Ca_{1.8}Fe^{2+}_{2.1}Fe^{3+}_{0.1}Mg_{2.3}Mn_{0.04}Al_{0.1}(Al_{1.9}Si_{6.1}O_{23})]$, ferropargasite $[Na_{0.8}K_{0.3}Ca_{1.8}Fe^{2+}_{2.2}Fe^{3+}_{0.1}Mg_{2.0}Mn_{0.1}Al_{0.2}(Al_{1.9}Si_{6.1}O_{23})]$ and hastingsite $[Na_{0.7–1.2}K_{0.3–0.4}Ca_{1.6–1.8}Fe^{2+}_{2.1–2.8}Fe^{3+}_{0.2–0.9}Mg_{1.2–2.0}Mn_{0.1–0.2}Al_{0–0.3}(Al_{1.8–2.2}Si_{5.8–6.2}O_{23})]$. Hastingsites are Fe-rich (Fe^{2+} = 2.05–2.82, Fe^{3+} = 0.05–0.87, mg# = 0.31–0.52) and potassian (K = 0.29–0.41), which corresponds with the miascitic affinity of the DAM syenites. The compositional trends of amphiboles in alkaline systems tend from ($Ca+Al^{IV}$)-rich and (Si+Na+K)-poor (early crystallisation) towards ($Ca+Al^{IV}$)-poor and (Si+Na+K)-rich (late crystallisation) content (GIRET *et al.,* 1980). Based on the composition of amphiboles in syenites, they are crystallised in the early magmatic stage (Fig. 1). Based on Al-in-hornblende of SCHMIDT (1992), the estimated crystallisation pressure for amphiboles is approximately 5–8 kbar, which suggests that the crystallisation of amphibole occurs ca. 15–25 km deep in the lithosphere.

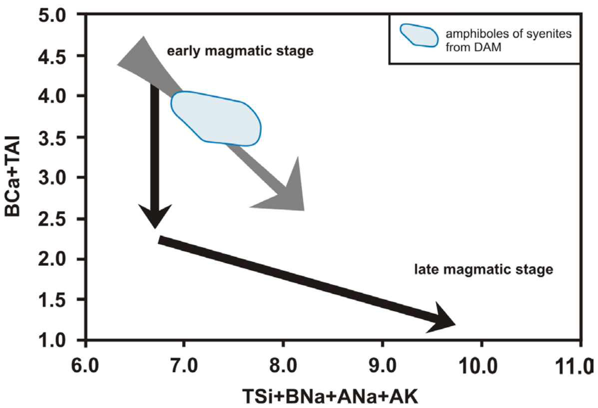

Fig. 1. *Compositional trend of amphiboles in syenites from DAM (GIRET et al., 1980).*

References

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