

## COMPOSITIONAL VARIATIONS OF CLINOPYROXENE FROM IJOLITE, DITRĂU ALKALINE MASSIF, ROMANIA

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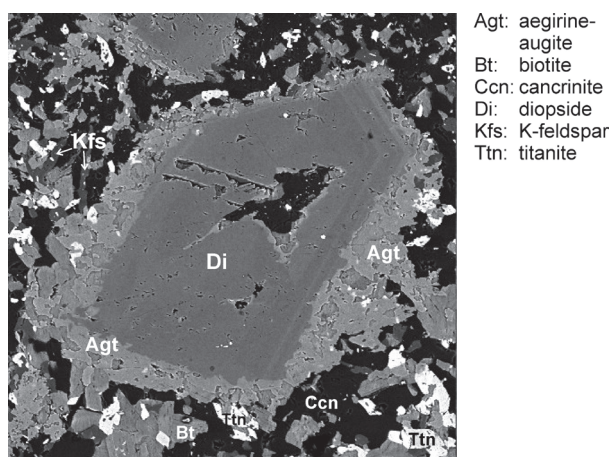
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The Ditrău Alkaline Massif in the Eastern Carpathians (Romania) is a Mesozoic alkaline igneous complex formed during an extensional event of the Alpine evolution associated with a rifted continental margin. The massif comprises a series of ultramafic to mafic rocks, felsic silica-saturated and oversaturated syenites and granites, as well as undersaturated alkaline rocks. Numerous dykes, including lamprophyres, tinguaites, alkali feldspar syenites and nepheline syenites, cut the whole complex. Additionally, small discrete rounded mafic aggregates, here named ijolites, occur within some of the tinguaites dykes. In the present study we use major element compositions of clinopyroxenes of the ijolite aggregates in order to discuss their chemical variations and try to define their possible magma sources.

Globular to lenticular dark grey ijolite aggregates with sharp margins vary in diameter from 1 to 9 centimetres. They have a porphyritic, fine-grained texture, and are composed of clinopyroxene (diopside, hedenbergite, augite, aegirine-augite), biotite, K-feldspar, cancrinite and accessory titanite, apatite and magnetite. Clinopyroxenes show several generations. Euhedral to anhedral phenocrysts show oscillatory or patchy zoning (Fig. 1). Their rims are resorbed and overgrown by a later clinopyroxene generations in all cases (Fig. 1). Small euhedral to anhedral diopside and aegirine-augite grains also appear as groundmass minerals.

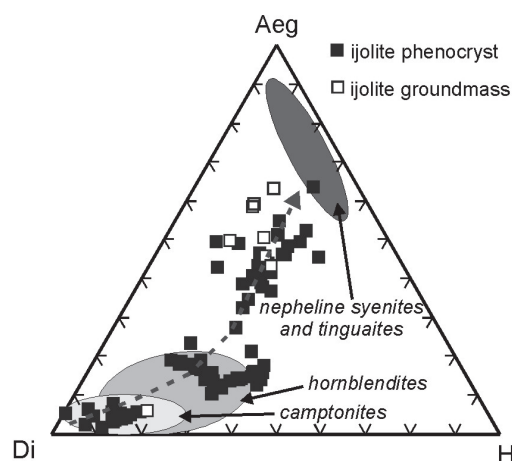


**Fig. 1.** BSE image of an oscillatory-zoned Cr-diopside phenocryst overgrown by aegirine-augite in ijolite.

Clinopyroxenes were analyzed with a JEOL 8900 electron microprobe in wavelength-dispersion mode at the Department of Geosciences, Universität Tübingen, Germany, using a beam current of 15 nA and an accel-

eration voltage of 15 kV. Additional mineral compositions were obtained with a JEOL JXA-733 electron microprobe at the Institute for Geochemical Research, Hungarian Academy of Sciences, Budapest, Hungary.

Clinopyroxenes are classified in terms of quadrilateral and sodic components. They are mainly of diopsidic to aegitic composition. They have variable diopside and aegirine contents of  $Di_{10-94}Aeg_{2-63}$ , while the hedenbergite content varies only in a narrow range ( $Hd_{0.5-40}$ ). The highest Di-contents belong to chromian diopsides (up to 0.68 wt%  $Cr_2O_3$ ), whereas pyroxenes with the highest Aeg-contents reach relatively high Zr-contents as well (up to 0.67 wt%  $ZrO_2$ ). All the pyroxenes exhibit high Al-content (up to 8.90 wt%  $Al_2O_3$ ). Ti/Al ratios of the phenocrysts fall between 0.125 and 0.250 indicating a relatively high crystallization pressure. Both groundmass diopside and aegirine-augite, and most of the aegirine-augite rims overgrowing phenocrysts have Ti/Al ratios above 0.25, which probably indicates a low crystallization pressure. Diopsides in ijolite have the same composition as clinopyroxenes in camptonites and hornblendites of the massif (Fig. 2) which suggest the same initial basanitic magma source for these rocks. The sodic fractionation trend from  $Di_{94}$  towards  $Aeg_{63}$  in the clinopyroxenes of ijolite approaches the aegirine composition in nepheline syenites of the massif (Fig. 2). The latter Na-enrichment of the ijolite clinopyroxenes could be a testimony of mixing between basanitic and nepheline syenitic magma.



**Fig. 2.** Compositional variation of clinopyroxenes of the Ditrău Alkaline Massif in terms of Di-Hd-Aeg end member mol%.