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Coronite structures in ferrogabbros as evidence for the existence of a high-Fe melt: Example from the Elet'ozero intrusive complex (north Karelia, Russia)

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Ferrogabbros of the Mid-Paleoproterozoic Elet'ozero titaniferous gabbro-syenite complex (Fennoscandian Shield) derived from Fe-Ti alkali basaltic melts are characterized by subsolidus coronitic structures. These structures are zoned and subdivided into three types:

(1) Multilayered olivine-biotite-kaersutite (pargasite) rims at the contact of Fe-Ti oxides (magnetite, titanomagnetite and ilmenite, often associated with high-Al spinel), which are the only intercumulus minerals in ferrogabbros, with cumulus plagioclase and clinopyroxene. These rims cannot be produced by interaction between oxides and silicates because oxides are devoid of *Mg, K*, and H_2O. It is probable that the crystallization of the rim assemblage in combination with oxides was related to the exsolution of drops of immiscible water-bearing low-temperature *Fe*-rich liquid which contained SiO_2, *Ti, Al, Ca, Na, K* and *Ba*, as well as *F* and *Cl.*

(2) The second-type coronas is developed at the contact of cumulus olivine and plagioclase and consists of small columnar crystals of orthopyroxene from the olivine side and pargasite with fine spinel grains from the plagioclase side. These coronites resemble classical coronas (orthopyroxene+clinopyroxene-spinel symplectite) in Precambrian olivine gabbronorites formed by interaction between these minerals at pressure >5 kbar (Sharkov et al., 2004).

(3) The third type of coronas formed in two stages around clusters of olivine and *Fe-Ti* oxides in a plagioclase matrix. At the first stage pargasite rim evolved around oxides, and reaction orthopyroxene along contacts of olivine and plagioclase occurred. The second stage was characterized by the appearance of overall symplectic rim, composed by pargasite, scapolite and mica, around the whole cluster. We suggest that formation of such rims occurred in contact of grains of cumulate olivine with drop of immiscible Fe-rich liquid. As a result, the second stage of reaction at olivine-plagioclase boundary occurred in water-rich environment which intensified the process and led to appearance of overall rim around whole cluster.

Appearance of drops of immiscible liquid very likely occurred in a relatively thin crystallization zone of the upward moving intrusion. The precipitation of cumulus silicates led to the additional enrichment of initiall Fe-rich intercumulus liquid in *Fe*. As a result the intercumulus melt got structure different from common basaltic melt which led to appearance of liquid immiscibility phenomenon. Due to lyophobic behavior, this melt coagulated in drops that are relatively uniformly dispersed in the cumulates. Under subsolidus conditions, the drops were solidified as coronitic structures. Thus, the study of the coronitic structures in the ferrogabbros of the Elet'ozero complex confirmed the existence of immiscible Fe-rich liquid in nature.

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