Geophysical Research Abstracts
Vol. 14, EGU2012-1244, 2012
EGU General Assembly 2012

Degassing and redox effects in the magma chamber of the Guli massif (Polar Siberia)

I.D. Ryabchikov (1), L.N. Kogarko (2), and D.V. Kuzmin (3)

(1) Institute for Geology of Ore Deposits, Moscow, Russia (iryabchikov@gmail.com), (2) Vernadsky Institute of Geochemistry, Moscow Russia , (3) Sobolev Institute of Geology and Mineralogy, Siberian Branch of the Russian Academy of Sciences

The Guli massif occupies a large area between the Maymecha and Kotui Rivers at the boundary of the Siberian platform with the Khatanga trough. It has a roughly oval shape of 35–45 km, and, including the two-thirds obscured by Quaternary deposits, has an area of 1500–1600 km2. The Guli massif, like many of the other alkaline-ultrabasic intrusions, is a composite, multi-stage pluton. The predominant rocks of the massif are dunites, which occupy about 60% of the total area, and a range of melanocratic alkaline rocks, which extend over about 30%. The other rock types, including melilitolite, ijolite, alkaline syenite and carbonatite, occupy less than 10% of the area.

Dunite intrusives were cut by numerous bodies of Ti-Fe ore pyroxenite (kosvite) that are composed mainly of pyroxene and titanomagnetite with accessory apatite and titanite, and form about 10% of the volume of the dunites. Among the volcanics and dyke rocks in the area surrounding the Guli massif olvine-rich meimechites play substantial role.

Variations of Mg# of olivines from dunite indicat presence of cryptic layering, whereas evolution of spinels from chromites to titanomagnetites in less magnesian varieties indicate gradual transition from dunites to kosvites. Original layering is obscured by intense folding.

Trace-element diagram normalized to pyrolite and Lu shows that interstitial material present between olivines of dunites is identical to meimechites. This implies that primary magma of the Guli intrusion had meimechite composition.

Some zoned olivines show regular decrease in Ni and increase in Mn from core to margin, whereas variation of Ca content in the same grains pass through several maxima and minima. This reflects accumulation of both Ca and CO_2 in the residual melt with episodic loss of CO_2 leading to the increase in the activity of CaO. Eventually this process leads to the formation of melilite-bearing rocks, alkaline magmas and carbonatites.

In many samples of kosvites Ni content in olivines correlates negatively with their Mg#'s. This is opposite to usual behaviour of Ni during the crystallization of olivine-bearing rocks. It may be explained by simultaneous crystallization of the large proportion of magnetite, which in turn indicates highly oxidized nature of this magmatic system.

Magma chamber of the Guli intrusion was originally filled with meimechite magma. Its crystallization created huge pile of olivine-rich cumulates. Kosvites, melilite-bearing rocks, alkaline rocks and carbonatites are most likely to have been formed by the crystallization of filter-pressed melts derived from earlier cumulates. The variety of rocks within the Guli magmatic complex are basically result of in situ differentiation.