Magma-rock interaction in the contact zone of Proterozoic mafic-ultramafic layered massif and Archean gneiss

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Kivakka mafic-ultramafic layered intrusion (2445 MA) intruded into Archean gneisses (2900 MA) and affect their composition along the contact zone. Evidence of interaction of Kivakka intrusion basaltic magma and host gneiss appears as recycled gneiss and norite rocks. Recycled rocks are presented in gneiss as aplite, acid segregations in gneisses, which contain mostly feldspar and quartz in symplectitic ingrowth and melanocratic rocks with quartz, feldspar, biotite, epidote, sulphide, carbonate.

Chemical composition of acid segregation and aplite is like younger granite (2100 MA), removed at 2-4 km, but concentration of Ca is higher and concentration of K is lower. As for rare earth elements, there concentration is lower than those in removed granite and hosted gneiss and is characterized by positive Eu anomaly. Configuration of REE lines corresponds to those in cumulative plagioclase from Kivakka intrusion. LREE/HREE ratio in acid segregations is higher, than in gneiss and norite. Such segregation looks like smelting as a result of partial melting after thermal effect on gneiss by intruding basalt magma.

Chemical composition of melanocratic recycled rocks are variable and characterized by relatively high Si, Ca and Al. The most revealing sample represent the composition which can be calculated as mixture of gneiss, norite and acid smelting in equal proportions. Such mixture proportions in this sample corresponds to rare elements concentration in the hybride melanocratic rocks. So, we can suggest, that intruding basaltic magma partly melted ancient gneiss and was mixed with new melt.

This process of gneiss melting and rock recycling was localized along the endocontact of magmatic camera and did not influenced the composition of intrusion magma even the isotopic data.