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Igneous protoliths and subsolidus history of peralumious websterite and granulite xenoliths from the Chyulu Hills, Kenya

A. ULIANOV AND A. KALT

University of Neuchatel, Switzerland;
(Alexey.Ulyanov@unine.ch; Angelika.Kalt@unine.ch)

The Chyulu Hills on the eastern flank of the Kenya rift result from volcanic activity between 1.4 Ma and historic times. Basanites of the Chyulu Hills contain a suite of peraluminous websterite and granulite xenoliths showing pronounced differentiation trends and forming a crystal accumulation sequence from a parental liquid (liquids) geochemically related to high-Al arc basalt / andesite magmas. Websterites are most mafic, whereas granulites are more Si- and Al-rich and less magnesian. The bulk rock compositions show remarkably low abundances of REE and HFSE at high Sr and Ba contents. REE are mildly fractionated [(La/Yb)n 3-33]. Accentuated positive Eu anomalies in granulites and much less pronounced enrichment in Eu in websterites are observed.

Websterites consist of igneous and subsolidus clino- and orthopyroxene, spinel, garnet and olivine. They largely preserved cumulate textures. Granulites occur in two types. Mg-Al two-pyroxene granulites bear the rather uncommon assemblage spinel, sapphirine, sillimanite, garnet, corundum, plagioclase, clinopyroxene and orthopyroxene, whereas Ca-Al clinopyroxene granulites are even more unusual with plagioclase, clinopyroxene, corundum, hibonite, mullite, sillimanite, and garnet as typical phases. In the Mg-Al granulites, large texturally independent grains of orthopyroxene, spinel and corundum seem magmatic. In the Ca-Al granulites, the texturally oldest spinel and hibonite may represent igneous relicts. The websterites show a complex P-T path from a magmatic stage (1200-1250 ^{o}C) through subsolidus cooling to the final P-T conditions (740-1000 ^{o}C / 1.4-2.2 GPa). The granulites seem to have experienced mainly cooling down to ca. 600-740 ^{o}C / <0.8 GPa, perhaps accompanied by some early compression. The geochemical data and the cooling-dominated *P-T* path obtained on granulite xenoliths fit well with the anticlockwise *P-T* path of Pan-African (650-615 Ma) granulite complexes within the Mozambique belt of Tanzania. They are also in line with the model of magmatic underplating / magma loading in the context of Pan-African juvenile arc terranes proposed by some authors. This suggests that the igneous protoliths of the websterites and granulites were intruded in the context of a Pan-African arc environment. The Mg-Al granulites xenoliths have no direct analogies worldwide, but are best comparable with granulites from Stockdale kimberlite in Kansas. The Ca-Al hibonite-bearing granulites are unique. Both granulite types enlarge the spectrum of known Ca-Al-Mg rich granulites.

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Petrogenesis of cumulate xenoliths from Nógrád-Gömör Volcanic Field (northern Hungary/southern Slovakia): Results from olivine hosted melt inclusions

Z. ZAJACZ[1], I. KOVÁCS[2], C. SZABÓ[2] , W. HALTER[1] AND T. PETTKE[1]

[1] ETH Zürich, IGMR, ETH Zentrum NO, CH-8092 Zürich, Switzerland (zajacz@erdw.ethz.ch)
[2] Dept. of Petrology and Geochemistry, Eötvös University, Pazmany P. Setany 1/c., H-1117 Budapest (geoistvan@freemail.hu)

Olivine hosted melt inclusions are widely used to get information on petrogenesis of different types of basaltic rocks. Alkaline basalts of the Nógrád-Gömör Volcanic Field (NGVF) contain a xenolith serie which is suspected to represent fragments of cumulate bodies crystallized from underplated basaltic melts. These rocks crystallized at high pressure (8-6 kbar)-high temperature (1150-1250 ºC) conditions and persumably spent significant time under similar condititons after crystallization.

Major goals of this study are to give new insight into the petrogenesis of the parental melt of these xenoliths and to find out if the olivine hosted melt inclusions in these high pressure-high temperature rocks represent the parental melt. We used three different approaches to determine the composition of the primitive parental melt: i) equilibrium trace element composition calculated using the trace element composition of the rock forming clinopyroxene, ii) major element composition determined using EMP on homogenized melt inclusions, and iii) major and trace element compositions from non-homogenized melt inclusions using LA-ICPMS.

We modeled the composition of the melt resulted by different degree of batch equilibrium partial melting of various upper mantle sources and reproduced the compositional data for the melt with this model.