Geochemistry and isotope tracing of the subduction related volcanism in the Timok magmatik complex, East Serbia

Author(s):
Moll, Melanie; von Quadt, Albrecht; Peytcheva, Irena; Heinrich, Christoph A.

Publication date:
2008-07

Permanent link:
https://doi.org/10.3929/ethz-b-000162007

Originally published in:
Geochimica et Cosmochimica Acta 72(12 / Supplement), https://doi.org/10.1016/j.gca.2008.05.016

Geochemistry and isotope tracing of the subduction related volcanism in the Timok magmatik complex, East Serbia

M. MOLL[1], A. VON QUADT[1], I. PEYTCHEVA[1,2] AND C.A. HEINRICH[1]

[1]ETH Zurich, IGMR (moll@erdw.ethz.ch, vonquadt@erdw.ethz.ch, heinrich@erdw.ethz.ch)
[2]Geological institute, BAS, Sofia (peytcheva@erdw.ehtz.ch)

The Timok volcanic complex (TMC) is part of the mineralized ABTS (Apuseni-Banat-Timok-Srednogorie) belt in SE Europe. During the upper Cretaceous this belt was formed in an arc setting due to the northward subduction of the Vardar Ocean under the European platform. In the TMC the calc-alkaline volcanism can be approximately divided into three stages; (1) the initial stage in the eastern part mainly composed of subaerial andesitic volcanism; (2) middle subaqueous basaltic to andesitic volcanism in the central and western part; (3) last stage intrusive granites in the western part. The magmatic products are represented in extrusive as well as intrusive facies, whereas only the initial stage shows porphyry Cu mineralization.

Literature data show that the magmatic activity and related ore formation in the initial stage occurred during 92-60 Ma (Late Cretaceous-Paleocene). Nevertheless these K/Ar ages are not very precise. First high-precision U/Pb single zircon analyses indicate an age of 86.2-84.6 Ma for the initial volcanism in the eastern part of the TMC. εHf_t data for zircons are ranging between +8 and +13 showing a mantle derived origin. The second phase volcanism (82.7-82 Ma) together with the last intrusive phase (70.5 Ma) show lower εHf_t zircon data (+4 to +8) indicating a rising influence of crustal material. $^{87}Sr/^{86}Sr_i$ isotope data also indicate this increasing crustal influence. $^{87}Sr/^{86}Sr_i$ values are changing from 0.7039 in the initial stage to 0.7055 in the last stage intrusive volcanism.

Fluid-mobile elements such as Cs, Rb, U and K show enrichment due to their transport from the slab into the source region.The High Field Strength Elements (HFSE) like Nb, Ta and Hf in contrast are depleted. The relatively flat middle (MREE) to heavy (HREE) rare earth element patterns probably reflect pyroxene and plagioclase fractionation. Most of the samples show an additonal slight negative Eu anomaly confirming the plagioclase fractionation. High Sr/Y (>20) show an adakite-like signature that may be the product of melting of eclogitic portions of the subducted slab. However this scenario may be unlikely because of the subduction of Jurassic “cool” oceanic crust in the late Cretaceous.