Evolution of the Lower Crust in the Point of View of Fluid-Rock Interaction Under the Bakony-Balaton Highland Volcanic Field

BIANCA NÉMETH[1,2], KÁLMÁN TÖRÖK[1], ISTVÁN KOVÁCS[1] AND CSABA SZABÓ[2]

[1] Geological and Geophysical Institute of Hungary, H-1143, Srefánia út 14, Budapest, Hungary

2 Lithosphere Fluid Research Lab, Institute of Geography and Earth Sciences, Eötvös University, Budapest, Hungary, H-1117, Pázmány Péter sétány 1/c

Plio-Pleistocene alkali basalt hosted mafic garnet granulite xenoliths were studied from the Bakony-Balaton Highland Volcanic Field (Hungary). Two particular samples were chosen for analyses (optical microscopy, microthermometry, major and trace element geochemistry, Raman and IR spectroscopy), which contain primary silicate melt inclusions (SMI) in the rock-forming minerals. The samples have non-equilibrium texture in contrast with majority of known mafic garnet granulite xenoliths. SMI were observed in plagioclase, clinopyroxene and ilmenite in both xenoliths. The major element geochemistry of the glass of SMI suggests the presence of a silica rich melt at relatively high temperatures (830-920 °C). The origin of the melts could have been derived by the melting of biotite-gneiss or quartz-amphibolite. Our data suggest that the SMI derived from partial melting of different lower crustal rocks having mafic and metasedimentary origin with an occasional presence of C-O-H±S±N fluids. Petrography suggests at least five fluid events in the lower crust. The IR study of the water content in the rock-forming minerals and in the host minerals, including SMI and fluid inclusions, suggest that the acidic melt contained relatively high amounts of water. The observed SMI and fluid inclusions locally rehydrated the originally dry minerals.

The research was supported by OTKA to Kálmán Török, project number: NN79943 and a MC IRG (NAMs-230937) to István Kovács.

When do insoluble particles act as good CCN?

A. NENES[12]*

[1]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta GA, USA (correspondence: athanasios.nenes@gatech.edu)

[2] School of Chemical And Biomolecular Engineering, Georgia Institute of Technology, Atlanta GA, USA

The ability of dust particles to serve as CCN under atmospherically relevant supersaturations depends on their mineralogy, size, morphology, and atmospheric processing. Most studies to date focus on the soluble fraction of aerosol particles when describing cloud droplet nucleation, and overlook the interactions of the hydrophilic insoluble fraction with water vapor. A new approach to include such interactions is presented, by combining multilayer Frenkel-Halsey-Hill (FHH) physical adsorption isotherm, Kohler theory and curvature (Kelvin) effects.

The importance of adsorption activation theory (FHH-AT) is demonstrated by measurements of CCN activity of mineral aerosols generated from clays, calcite, quartz, and desert soil samples from Northern Africa, East Asia/China, and Northern America. Based on the dependence of critical supersaturation with particle dry diameter, it is found that the FHH-AT is a better framework for describing fresh (and unprocessed) dust CCN activity than classical Köhler theory (KT). Ion Chromatography (IC) measurements performed on fresh regional dust samples indicate negligible soluble fraction, further supporting FHH-AT.

The results presented reshapes the conventional model of CCN activity, as it demonstrates that dust particles do not require deliquescent material to serve as atmospheric cloud nuclei. A droplet parameterization framework for large scale models that includes the new CCN activation physics is also developed and constrained by laboratory measurements. The framework accounts for aging of dust (via deposition of hygroscopic material), and is included within a global model framework to assess the impact of dust on warm cloud droplet number.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.14