Mineral assemblages and metamorphic history of granulites in the Rychleby Mts., Bohemian Massif

KATEŘINA SCHLÖGLOVÁ*, SHAH WALI FARYAD, DAVID DOLEJŠ AND HELENA KLÁPOVÁ

Institute of Petrology and Structural Geology, Charles University, Albertov 6, 128 43 Praha 2, Czech Republic
(*correspondence: schloglo@gmail.com)

Relics of high-pressure metamorphic rocks are preserved in various crustal and mantle segments of the Variscan orogen in central Europe. These rocks may provide important insights into early stages of plate convergence and burial as well as exhumation mechanisms. We use mineral assemblages and chemistry to reconstruct the pressure-temperature (P-T) paths of high-pressure granulites in the Rychleby Mts., Bohemian Massif. Mafic granulites consist of garnet, omphacite, kyanite, two feldspars, and quartz with accessory rutile and zircon. The peak assemblage was partly replaced by paragmatic amphibole and biotite during exhumation. Garnet grains are zoned from Gr36Py10Alm54 (core) to Gr20Py38Alm42 (rim), and host inclusions of phengite, omphacite, unmixed feldspars, kyanite, and rutile. Omphacite composition varies from Di59Hd20Jd17 (inclusions in garnet) through Di80Hd10Jd10 (porphyroblasts) and Di60Hd30Jd10 (symplectite intergrowths with plagioclase). Reintegrated composition of the feldspar porphyroblasts is Or43Ab53An04. Felsic granulite variety is composed of garnet, two feldspars, and quartz with accessory rutile and zircon. The peak assemblage was partly replaced by biotite and zoisite. We have applied constrained by garnet-omphacite-kyanite-quartz and garnet-kyanite-rutile-zeolite exchange equilibria in order to estimate the H2O content, which facilitated preservation of peak mineral assemblages. The reconstructed pressure-temperature path is consistent with extrusion of bimodal calc-alkaline igneous suite from orogenic root.

Biochemical characterization of single weathering hyphae of Paxillus involutus using CLSM and synchrotron based μFTIR

A. SCHMÄLENBERGER1,2, A.W. BRAY3, A.L. DURAN4,5, J.R. LEAKE1,2, S.A. BANWART1, L. TATIC1, G. CINQUE5, M.D. FROGLEY5, J. FILIK5, J. PIJANKA1, S. BONNEVILLE1, L.G. BENNING5 AND M.E. ROMERO-GONZALEZ1,6

1Cell-Mineral Research Centre, The University of Sheffield, Broad Lane, Sheffield, UK
2Life Sciences, The University of Limerick, Ireland
3School of Earth and Environment, University of Leeds, UK
4Animal and Plant Sciences, The University of Sheffield, UK
5Diamond Light Source Ltd, Didcot, UK

The mycelium of symbiotic ectomycorrhizal fungi (EM) increases nutrient uptake by the plants through fungal secretion of low molecular weight organic acids that can accelerate mineral dissolution. This EM weathering with pine trees plays a key role in nutrient mobilization processes and pedogenesis. Here we report first insights into the chemical variability of the weathering mycelium when studied on a micrometer scale using Confocal Laser Scanning Microscopy (CLSM) and synchrotron based micro Fourier Transform Infrared (μFTIR) spectroscopy. pine seedlings ectomycorrhizal with Paxillus involutus were grown in microcosms containing wells with olivine, quartz, basalt, granite and limestone. CLSM analysis of EM hyphae with the molecular probe SNARF4F in contact with basalt and limestone revealed a pH below or at 4.6 while the pH of EM in contact with granite identified pH values that varied from pH 4.6 to 6.5 with variations observed within single cells. Chemical μFTIR maps of single hyphae at a resolution of 5x5 μm identified variabilities within the spatial distribution of lipids, amides and carbohydrates. Particular distinctions in intensities of carbohydrates and lipids were discovered on a single cell level.

We conclude that mineralogy has a significant impact on the biochemistry of colonizing symbiotic EM mycelia, individual hyphae and cells. Earlier studies showed that exudation of oxalate is increased in the presence of basalt and limestone[1] and here we report the corresponding biochemical changes that take place on a single hypha scale.