New UHP eclogite in between UHP areas, WGR, Norway

Dirk Spengler[1] and Taisia A. Alifirova[2]

[1] Faculty of Geology, Geophysics and Environmental Protection, AGH University of Science and Technology, 30-059 KRAKÓW, Poland;
[2] Department of Lithospheric Research, University of Vienna, 1090 VIENNA, Austria.

The Western Gneiss Region (WGR) in W Norway is known for three major domains of high-grade gneisses that host isolated eclogites with UHP metamorphic conditions (Spencer *et al.*, 2013). Each domain has coastal occurrences that contain evidence for metamorphism to have occurred within the diamond stability field, either by the index mineral itself or by thermobarometry or both. A newly studied coastal eclogite from Synes (Vigra island) situated in between the two northern UHP domains adds to these occurrences. Minerals of the assemblage garnet, omphacite, orthopyroxene and minor rutile have coarse grain sizes. Cm-size orthopyroxene and omphacite contain inclusions of garnet irregular in grain shape (Fig. 1a). Omphacite is poikiloblastic and has lamellae of orthopyroxene. Garnet contains rutile inclusions. Amphibole and white mica appear to have formed as secondary minerals. Microstructure and preservation of the primary mineral assemblage suggest a magmatic eclogite origin and low strain accumulation. The largest orthopyroxene grains have core compositions with Al_2O_3 as low as 0.25 wt.% (Fig. 1b) that indicate 4.75 GPa and 863 °C when thermobarometric calibrations of Brey & Köhler (1990) are applied. This sample shows that metamorphic pressures in between the two northern UHP domains were within the diamond stability field. The area between the two southern UHP domains is recently recognised to have experienced minimum metamorphic conditions equivalent to the graphite-diamond phase transition (Spengler *et al.*, 2021). Consequently, evidence for WGR crustal rocks to have been in the “diamond-facies” stretch from the NE to the SW along the entire coast covered by UHP domains and interjacent areas.

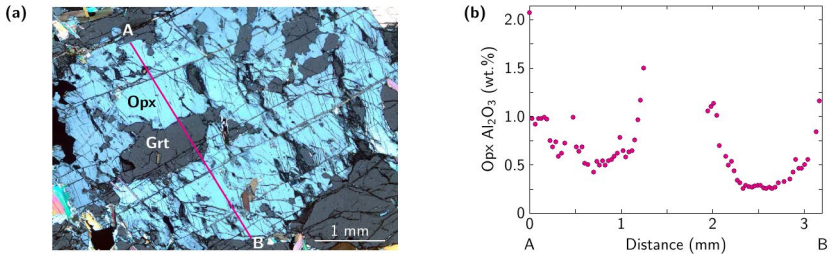

Figure 1- Synes eclogite. (a) Photomicrograph (nearly XPL) that shows a coarse orthopyroxene (Opx) grain with inclusions of garnet (Grt) irregular in grain shape. (b) Al_2O_3 concentration in orthopyroxene along a profile shown in panel a.

This work is financially supported by the Norwegian Financial Mechanism 2014-2021 and the Polish National Science Centre, project no. 2020/37/K/ST10/02784.

Brey, G.P., Köhler, T., 1990. Geothermobarometry in four-phase lherzolites II. New thermobarometers, and practical assessment of existing thermobarometers. *Journal of Petrology* 31, 1353-1378.

Spencer, K.J., Hacker, B.R., Kylander-Clark, A.R.C., Andersen, T.B., Cottle, J.M., Stearns, M.A., Poletti, J.E., Seward, G.G.E., 2013. Campaign-style titanite U-Pb dating by laser-ablation ICP: implications for crustal flow, phase transformations and titanite closure. *Chemical Geology* 341, 84-101.

Spengler, D., Alifirova, T.A.,van Roermund, H.L.M., 2021. Subcratonic and tectonic evolution of pyroxenite and eclogite with lamellar inclusions in garnet, Western Gneiss Region, Norway. *Journal of Petrology* 62, egab008.