# Sampling and Analytical methods

We collected ten peridotite (8 mantle harzburgite and 2 mantle dunite) and fourteen chromitite (6 MCTZ chromitite/dunite and 8 mantle chromitite) samples from the Aladag ophiolite for their mineral and whole-rock geochemistry. Measurements for mineral chemistry were carried out via wavelength dispersive spectrometry (WDS), using a JEOL JXA 8100 electron microprobe (EMP) at the Institute of Geology, Chinese Academy of Geological Sciences in Beijing, China. EMP operating conditions were 15 kV and 20 nA with a beam diameter of 1μm. Natural and synthetic standards were used for calibrations. The amount of Fe3+ in chromites was calculated assuming the ideal chromian spinel stoichiometry of A2+B3+2O4.

We acquired backscattered electron (BSE) images of the needle-shaped exsolutions in chromites (Fig. 5a-c), using a Zeiss DSM-962 scanning electron microscope (SEM) at the German Research Center for Geoscience (GFZ), Potsdam, with an accelerating voltage of 20 kV and a focused electron beam with a slit width of 120 μm. Two electron transparent foils of 15 × 10 × 0.15 μm size were cut normal to the surface of one polished chromitite thin-section with a Focus Ion Beam device (FEI FIB 200) at the GFZ (Wirth 2004). The inclusion-bearing foil was studied with the aid of FEI TECNAI G2 F20 X-Twin transmission electron microscope (TEM) operated at 200 kV with a Schottky field emitter gun as the electron source, coupled with Energy-dispersive X-ray (EDAX) and an Electron Energy Loss Spectroscopy (EELS). We obtained filtered TEM images by applying a 20 eV window to the zero loss peak of the energy-loss spectrum. EDAX analyses were performed by scanning a pre-selected area to avoid mass loss (Fig. 5d). We identified the needle-shaped cpx exsolutions as shown by the EDS spectra (Fig. 5d).

All the samples for bulk-rock geochemical analyses were carefully cleaned, crushed and ground in an agate mortar to pass a 200-mesh screen. Bulk-rock major oxides compositions for harzburgites were determined by X-ray Fluorescence (XRF) on fused glass beads using a PW4400 spectrometry at the National Research Center for Geoanalysis in Beijing, China. Water and CO2 contents were determined by gravimetric techniques in which each sample is heated in a closed container and the water vapor is collected in a separate tube, condensed and then weighed. The detection limit for H2Oand CO2 is 0.01wt. %. The uncertainties for major elements vary from 1 % to 3 %. In our geochemical plots, oxides are reported as wt. % and are recalculated and plotted on anhydrous (volatile-free) basis where the oxide sum is normalized to 100 %.

Trace elements, including rare earth elements (REE), were determined by inductively coupled mass spectrometry (ICP-MS) at the National Research Center for Geoanalysis in Beijing, China. National reference material GBW07102 of ultramafic rock composition and GBW07105 of basaltic rock composition were measured simultaneously to ensure consistency of the analytical results for major and trace elements.Sample 13YALA-3-8 was measured twice during the whole analytical process.

Platinum-group elements (PGEs) were concentrated using the nickel sulphide fire assay and Te-coprecipitation method (Jackson *et al.* 1990), and were analyzed using ICP-MS at the National Research Center for Geoanalysis, Chinese Academy of Geological Sciences, Beijing. PGEs reference material GBW07290 was measured to ensure consistency of the analytical results for PGEs. Analytical processes have been described in detail by Dai *et al.* (2011).