Redox profile through the Siberian craton: Fe K-edge XANES determination of Fe^{3+}/Fe^{2+} in garnet from peridotite xenoliths of the Udachnaya kimberlite

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In cratonic lithosphere the oxygen fugacity (fO_2) of peridotite is expected to broadly decrease with increasing depth. However metasomatic events may locally perturb this trend, often leading to oxidation [1,2].

We have investigated the fO_2-depth variation in the Siberian Craton using a suite of fresh garnet lherzolites from the Udachnaya East kimberlite. Garnet $Fe^{3+}/\sum Fe$ was detemined using XANES spectroscopy [3] on the X-ray Fluorescence Microscopy beamline of the Australian Synchrotron.

Thermobarometry established that the samples range in pressure from 3.9-7.1 GPa and lie along a typical cratonic geotherm. Several samples exhibit evidence for metasomatic enrichment, with elevated abundances of Ti, Zr and Y in garnet and clinopyroxene, broadly consistent with an earlier study of another Udachnaya xenolith suite [4]. Others are less or unaffected by metasomatism, with very low abundances of these elements.

$\Delta\log_{10}[fO_2]^{FMQ}$ [52] varies from -2.5 to -5.9 log units and broadly decreases with increasing pressure. The metasomatised samples all derive from P > 5 GPa and most exhibit a resolvable shift to fO_2 values ≈1.5-2.0 log units higher than the unmetasomatised ones, at given pressure.

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Assessment of heavy metal contamination in soils around Gebze industrial area, NW-Turkey

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Soil contamination poses a serious risk to human health, particularly in densely populated areas. Pollution from industries activities can be introduced into the food chain via soil, plant and water and threatens human health. Increase in heavy metal pollution in the soils of Gebze (Turkey) due to intense industrialization and urbanization has become a serious environmental problem. There are two large organized industrial zones in Gebze; the Gebze Organized Industrial Zone (GOIZ) and the Dilovası Organized Industrial Zone (DOIZ). This region hosts several industrial facilities which are the main source for hazardous wastes which include paint, plastic, electric, metal, textile, wood, automotive supply industry, food, cosmetics, packing, machinery, and chemicals. Soil samples were collected from these two industrial zones and analyzed for their metal contents. Results of the analysis show that the soils are characterized by high concentrations of Cd, As, Pb, Zn, Mn, Cu, Cr and Hg. Since concentrations of other elements do not exceed the permissible levels, they are not evaluated. Concentrations are 0.05-176 mg/kg of Cd, 10-1161 mg/kg of Cr, 7.87-725 mg/kg of Cu, 1.50-65.60 mg/kg of As, 17.07-8469 mg/kg of Pb, 1.96-10000 mg/kg of Mn, 29.5-10000 mg/kg of Zn, and 9-2721 μg/kg of Hg. Application of factor, cluster and correlation analysis showed that heavy metal contamination in soils originates from industrial activities and heavy traffic which are of anthropogenic origin. Contaminations in soils were classified as geoaccumulation index, enrichment factor, contamination factor, and contamination degree. Integrated pollution index (IPI) values indicate that heavy metal pollution levels of soils collected from industrialization sites are greater than those from distal parts of industrialization. Spreading of hazardous wastes from industrial facilities in the study area via rain or wind is the main source of soil pollution. In addition, traffic-related metal pollution is also observed. In order to mitigate the impact of environmental pollution, factory wastes must be reliably disposed.