

## Os-isotopes constraints on the dynamics of orogenic mantle: the case of central Balkans

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The origin and evolution of Phanerozoic SCLM during orogenesis is a puzzling issue because of its multi-episodic and time-integrated melting and enrichment history. This is especially so in the Alpine-Himalayan accretionary orogen, which formed at a diffuse and long lived convergent boundary between Eurasia and Gondwanaland. The accretion of thin continental slivers and numerous oceanic island arcs resulted in a complex collage of continental blocks intercalated with ophiolitic terrains. The net effect of this accretion is mingling of severely mismatched geological and geochemical compositions.

We aim to monitor lithospheric mantle development under the Balkan part of the Alpine-Himalayan belt. In our holistic approach we combine Os isotopic and HSE as well as whole rock and mineral compositions of a number of mantle xenoliths in Palaeocene alkaline basalts, Mesozoic ophiolites and Oligocene-Miocene lamproitic lavas sourced within the lithospheric mantle.

Both ophiolitic peridotites and lithospheric mantle of the Balkan sector of the Alpine-Himalayan belt demonstrate similarly high extents of the previous melt extraction. Further resemblance is seen in the Os isotopic variation observed in ophiolites and in the Serbian lithospheric mantle, implying fluid-induced enrichment of a depleted Proterozoic/Archaean precursor, whereby the enriched component had suprachondritic Os isotopic composition. The ultimate source of this component is attributed to the subducting oceanic slab. We tentatively propose a two-stage scenario connecting lithospheric mantle with ophiolites and lamproites in a geologically reasonable fashion: i) the first stage took place in a suprasubduction oceanic environment, and it is responsible for the fluid-related enrichment of depleted mantle; ii) the second-stage connects the lithospheric mantle and lamproites during the partial melting that generated lamproitic melts. This is in accordance with the recent model<sup>1</sup> proposing that the part of the lithospheric mantle under the Balkans has seen oceanic lithosphere development.

[1] .Prelević, D. *et al*, EPSL, 2013. **362**: p. 187-197.

## Effect of surface heterogeneity and interfacial water on surface potential

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At the metal oxide crystal plane, exposed to the electrolyte aqueous solution, one or more amphoteric surface groups could be present. Different surface groups could be regularly distributed according to crystal structure, but also on two or more distinct surface patches.

The stability of surface groups depends on their thermodynamic and kinetic properties. If more than one kind of surface group is present at the crystal plane the surface potential, as well as the other surface properties, would depend on surface concentrations of each surface sites, their thermodynamic equilibrium constants, and potential interactions between them. It is expected that the most stable surface species predominates at the surface and determines the overall surface properties. Different surface areas at the same crystal plane are in direct electrical contact through the bulk of the crystal, and consequently they are affected by same surface potential if the solid is conductive. The resulting surface potential is influenced by equilibrium at all surface patches, and will be somewhere between two extreme values characterized individual surface areas.

The effect of two different surface sites and surface transformations of hematite 001 surface [1] were measured by means of single crystal electrode [2]. The results are interpreted by surface complexation model using the general model of electrical interfacial layer.

The measured  $\Psi_0(\text{pH})$  function is nonlinear with a broad zero-potential region around the point of zero potential. Electrokinetic measurements of the same crystal planes give the clear isoelectric points and higher values of the zeta potential with respect to surface potentials. This unexpected behavior could be explained by considering pH dependent charging of the interfacial water layer affecting electrokinetic behaviour but not the surface potential [3].

[1] J. Lützenkirchen *et al* (2013) *Geochimica et Cosmochimica Acta*, submitted. [2] N. Kallay *et al* (2005) *J. Colloid Interface Sci.* **286**, 610-614. [3] N. Kallay *et al* (2012) *J. Colloid Interface Sci.* **375**, 167-171.