

## Recycled oceanic crust as a possible source of kimberlites - Isotopic evidence from perovskite, Udachnaya-East pipe, Siberia

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In an effort to better understand the sources and petrogenesis of kimberlitic melts, we report new results from the ultrafresh Udachnaya-East kimberlite, Siberia. Earlier results [1,2] indicate that initial kimberlite magmas are H<sub>2</sub>O-poor and rich in mantle-derived Cl and CO<sub>2</sub>. Additional insights come from a recently identified inclusion from this pipe, which may represent a high-purity sample of the kimberlite melt component, uncontaminated by disaggregated xenoliths. Mineral compositions (fresh olivine, phlogopite, perovskite) in this inclusion are identical to those in the host kimberlite groundmass, but phlogopite and perovskite are unusually abundant (10 wt% perovskite). The bulk composition of the inclusion is ultramafic (32% MgO) and trace element concentrations are controlled by perovskite, with strong LREE enrichment and depletions at Sr and Zr; the latter are absent in the host kimberlite groundmass. Phlogopite Rb-Sr and Ar-Ar dating indicate a  $\approx$ 370 Ma age, consistent with published pipe emplacement ages. The inclusion is thus best described as a late-stage cognate inclusion, or autolith. Initial Sr-Nd isotope ratios in inclusion perovskite (0.7030,  $\epsilon_{Nd} +5.5$ ) differ from those of the (acid-leached) host kimberlite groundmass (0.7048, +4.0), possibly reflecting xenocrystic contamination in the latter. Alternatively, age corrections may be compromised, even in acid-leached groundmass, by the complex, polyphase nature of the kimberlite [2]. By contrast, the inclusion perovskite, with Rb/Sr  $\approx$ 0, is a much simpler matrix and thus preserves a more straightforward isotopic record of the kimberlite melt component. The isotopic data, in particular the low <sup>87</sup>Sr/<sup>86</sup>Sr, provides support for earlier suggestions [3], partly based on Hf-Nd isotope data [4], that recycled subducted MORB may form part of the kimberlite melt mantle source. Further isotopic data (Pb, Hf) will be reported.

### References

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## Harnessing biomineralization: From cell factories to functional bionanomaterials

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Bacteria from the environment carry out many diverse processes which result in the production or transformation of minerals. This biomineralisation leads to the formation of mineral deposits which are retained on the bacterial cell surface or are scaffolded outside the cell or upon, or within, extracellular polymeric matrices. The cell therefore has a dual function in supporting the solid material, while providing the metabolic activity and localised chemical environment to promote biomineral growth.

Many of the biomaterials formed by bacterial action have potentially useful properties in various technological applications. Bio-growth is particularly useful because the scaffolding helps to prevent the agglomeration processes that beset the commercial production of nanoparticles, while the controlled growth can be steered towards the production of particular particle sizes. Both of these objectives are difficult to achieve by chemical production processes.

Nanoparticles are highly prized because they are very reactive and have properties which can be different from bulk materials. The 'cell factory' is a scalable approach to the bulk production of stable nanoparticles in a reproducible way.

Case histories will be presented to illustrate the production of bionanomaterials for applications in biomedicine, chemical industry, environmental remediation and clean energy, and the scope for using wastes as resources for nanomaterial production will also be discussed.