Microstructural development of in situ deformed and heated polycrystalline halite in depenpendence of silica gel

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Our research focused on the influence of silica gel on the texture development and the mechanical behaviour of predeformed polycrystalline halite. In situ experiments help further our understanding of the fundamental mechanisms of the processes taking place during texture development. With different methods both single grain orientation analyses and the texture development in the bulk were successfully obtained.

The results show the influence of silica gel (amorphous phase) either on the texture development and on the physical properties (as stress/ductility behavior) focusing not only on bulk texture but also on the changes in the single grain orientations. The polycrystalline samples doped with silica gel show an increase in the yield strength and a higher Young's modulus (stiffness). In the texture development a preservation of the starting texture is observed, which correlates well with the mechanical behavior. The amorphous phase probably protects the single grains from deformation, preventing strain accumulation by the introduction of defects and thereby preserving the grain shape.

Heterogeneity and anisotropy in the lithospheric mantle

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Despite extensive geophysical investigations and studies of xenoliths and peridotite massifs, the lithospheric mantle, in particular beneath continents, remains a 'mysterious' layer. Seismic anisotropy data point to anisotropic physical properties, and hence structures, coherent at scales of 100s km. Receiver functions, in contrast, imply in lateral and vertical heterogeneity at scales < 10km within the mantle lithosphere, but the physical origin of the reflectors are not clear. We will present constraints on the lithospheric mantle seismic properties based on the analysis of an evergrowing database of naturally deformed peridotites and review recent studies of our group on naturally deformed peridotites. These studies highlight the role of reactive percolation of melts and fluids on the evolution of the lithospheric mantle, focusing on the creation of heterogeneity and the feedbacks between melt percolation and deformation. Based on these data, we will discuss the effect of these processes on evolution of the physical properties of the mantle, in particular the rheology. For instance, analysis of naturally deformed shows that static reactive percolation may significantly change the composition, but does not erase the fabrics and hence the anisotropy of physical properties. The latter, which is inherited from the major deformation episodes that shaped the continental plates, may be preserved for very long time spans, playing a major role on the subsequent evolution of continental plates.

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