

FOR 2125: Structures, properties and reactions of carbonates at high temperatures and pressures

Understanding the composition and physical properties of the Earth's transition zone and lower mantle and the processes governing their behavior is one of the grand challenges in modern Geoscience. One of the large gaps in our knowledge concerning the Earth's mantle is the role of carbonates. It is possible that > 90 % of the Earth's carbon is contained in the deep Earth and it is estimated that 0.9 - 1.8 Tmol carbon is subducted per year, mainly in the form of carbonates. Evidence for primary carbonate in magmas coming from depths > 150 km has long been available and diamonds formed at great depths (> 660 km) have been found.

However, experimental support for the conclusions drawn from analyzing natural samples is very scarce, simply because the number of experiments in which structure-property relations of carbonates have been determined at pressures above 20 - 30 GPa and high temperatures is very small due to the significant technical difficulties which have to be overcome. The Research Unit will therefore focus on understanding phase relations, crystal chemistry, physical properties and reactions of carbonates at conditions relevant to the transition zone and the lower mantle. This overarching goal will be reached by performing state of the art experiments, for which in several cases the required equipment needs to be developed first. As no Geoscience Institute in Germany has all of the capabilities required to tackle this question in a comprehensive manner, we have formed a Research Unit located in Frankfurt, Bayreuth, Berlin/Potsdam, Freiberg and Hamburg. There is no alternative to such a multi-site approach, as each group has a mutually complementing set of instruments and experience.