Elastic properties of natural and synthetic carbonates by Brillouin scattering

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Carbonates play a primary role in the global carbon cycle, are relevant for industrial applications, and are essential constituent of the skeletal structure of numerous organisms. For these reasons the investigation of the properties of carbonates is of primary importance. In particular, their elastic coefficients give us information regarding the mechanical behavior and the relationship between the interatomic interactions and the macroscopic thermodynamic properties of this class of materials.

Due to the extended high-pressure stability of some of the most common carbonates, the systematic study of their elastic tensor at high-pressures can help to identify their presence and distribution in the Earth interior.

Here we present the elastic tensor of natural carbonates determined experimentally by measuring Brillouin scattering at both ambient conditions and high pressures, as part of a project dedicated to the systematic relationship between structure evolution and elasticity of the most common carbonate minerals across the pressure regime of the upper mantle. We also present the first experimental determination of the high-pressure elastic properties of amorphous $CaCO_3$, which is an important precursor of crystalline phases in biomineralizations, across a pressure-induced polyamorphic transition. This research is within the scope of the DFG funded “CarboPaT” research group (FOR 2125).