chemisch
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Gegründet im Jahre 1869 von H. Hlasiwetz,
J. Loschmidt, J. Petzval und J. Stefan

EINLADUNG

zum Vortrag
von

Prof. Dr. Michael Carpenter

Dept. of Earth Sciences, University of Cambridge, UK

Strain, order parameters, elastic anomalies and anelastic loss associated with phase transitions in minerals and functional oxides

am Dienstag, 6. Dezember 2011, um 17:30 Uhr

Ort: Lise-Meitner-Hörsaal, Fakultät für Physik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmanngasse 5, 1. Stock

Barrierefreier Zugang: Boltzmanngasse 5, Lift, 1. Stock rechts über den Gang zum Hintereingang des Hörsaals

Abstract:
Almost any structural change that occurs in a crystal, including atomic displacements, magnetic and ferroelectric ordering, cooperative Jahn-Teller distortions, cation ordering, charge ordering and spin state transitions, is typically accompanied by lattice distortions. These can be characterised in terms of strains, determined from measurements of lattice parameters, which are typically in the range ~0.001-0.04 for a phase transition. It follows that if there are changes in strain state there must also be changes in the elastic constants, and phase transitions are characteristically accompanied by changes in elastic constants of 10's of %. Accompanying most phase transitions, also, is the development of some microstructure such as transformation twins or antiphase domains. If these are mobile under application of an external stress they can give rise to substantial acoustic losses when measured by methods such as Resonant Ultrasound Spectroscopy.

Investigation of materials with multiple instabilities from the perspective of strain and elasticity can provide important insights into the thermodynamics, mechanisms and dynamics of the transformation processes involved. The relevance of these concepts to the elastic behaviour of minerals in the Earth's crust and mantle, and to the properties of materials with potential applications in devices, will be illustrated using experimental data for phase transitions in the mineral quartz and a selection of perovskite phases, including $SrZrO_3$ $(Ca,Sr)TiO_3$ and $Pr_{0.48}Ca_{0.52}MnO_3$.

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