TORSIONAL DEFORMATION OF CALCITE

Schuster, R.[1], Abart, R.[1] & Schafler, E.[2]

[1]Department. of Lithospheric Research, University of Vienna, Althanstrasse 14, 1090, Vienna, Austria
[2]Faculty of Physics, University of Vienna, Boltzmanngasse 5, 1090, Vienna, Austria
e-mail: roman.schuster@univie.ac.at

Torsional deformation is one of the most important methods of experimental rock deformation. The Paterson type apparatus is the most commonly used torsional deformation machine in the earth sciences. It allows for torsional deformation of cylindrical samples at temperatures up to 1600 K and at pressures up to 500 MPa (PATERSON & OLGAARD, 2000). A different torsional deformation method that is currently hardly used in geosciences is High Pressure Torsion (HPT). It was developed in materials science to synthesize and investigate bulk nanostructured materials. It permits deformation experiments under substantially higher pressures than the Paterson apparatus of up to 10 GPa and at temperatures up to 800 K. A schematic of this method is shown in Fig.1. The disk shaped sample is placed in a cavity between two anvils. After pressure of several GPa is applied on the sample, one of the anvils is then rotated. The friction between sample and anvils leads to shear deformation of the sample. HPT is known from various studies in particular on metals to lead to pronounced grain refinement and to very high defect densities (ZHILYAEV & LANGDON, 2008). This deformation method is applied on calcite to study the microstructural evolution during deformation. Calcite is particularly suitable for HPT deformation, since it can be plastically deformed at relatively low temperatures and undergoes two phase transformations in the pressure range that can now be reached with HPT

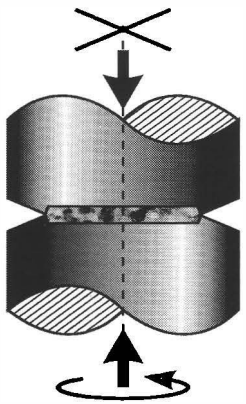

Figure 1. Schematic drawing of HPT-deformation

PATERSON, M.S., OLGAARD, D.L. (2000): Journal of Structural Geology, 22, 1341–1358.
ZHILYAEV, A.P., LANGDON, T.G. (2008): Progress in Materials Science, 53, 893–979.