Experiment Report

The data have been successfully analyzed and a manuscript of the investigation has been submitted. The abstract of the publication is given below.

Isomorphic lattice collapse of crystalline lattices under pressure is a rare and intriguing phenomenon, the most famous examples being samarium sulfide and cerium metal. They are cubic under ambient conditions and collapse isomorphically under pressure, with about 15 % volume reduction. In SmS the transition is ascribed to a change of the 4*f* chemical valence. The collapse in Ce is connected with altering contributions of the 4*f*-electrons to the chemical bonding, though details are still debated. In contrast, the investigated YCo_5 is a compound with a stable valence and without 4*f* electrons. We have found that an entirely new type of isomorphic transition occurs in this hexagonal metallic compound under hydrostatic pressure of 19 GPa. Here, the lattice collapse is driven by magnetic interactions and can be characterized as a first-order Lifshitz transition. This is shown in a combined investigation using ab-initio electronic structure calculation and high-pressure x-ray diffraction. Our studies prove the existence of a bistable bonding state due to magnetoelastic interaction.