Unconventional behavior of Ce and Yb compounds induced by extreme pressure

Thanks to the specific electronic structure the rare earth-based compounds, especially those containing Yb, Ce or Eu, often exhibit exceptional magnetic properties. In our study we have focused on cerium-based compound Ce_2Pd_2In belonging to the family of R_2T_2X compounds crystallizing in tetragonal Mo_2FeB_2-type structure. Previous studies revealed presence of two magnetic phase transitions ($T_C \approx 4.1$ K and $T_N \approx 4.5$ K) and strong dependence of magnetic ground state on the changes of chemical composition. We carried out detailed ambient pressure characterization so as to expand our knowledge about this interesting system and to refine some previous results, especially the positions of phase transitions were newly determined as $T_C \approx 4.16$ K and $T_N \approx 4.65$ K and Ce magnetic moment was found to reach the value of 1.87 μ_B/Ce. However, the main tool used in frame of the thesis is application of mechanical pressure (both hydrostatic and uniaxial) which allows us to affect the interatomic distances and thus also the related physical properties without the composition change. Hydrostatic pressure acts in the same way on the whole lattice, while the uniaxial one allows to act solely in the chosen direction. The results of high pressure experiments are put into context with temperature evolution of crystal lattice investigated by low temperature X-ray diffraction. Based on these results, hydrostatic pressure is supposed to act more on the *a*-parameter, which leads to approaching of atoms in the basal plane, affecting the exchange interactions in the system and preference antiferromagnetic phase over the ferromagnetic one. On the other hand, the uniaxial pressure acts on the parameter *c* showing no significant effect on the temperatures of phase transition.