Chemical composition measurements and modelling of nanometric thin films

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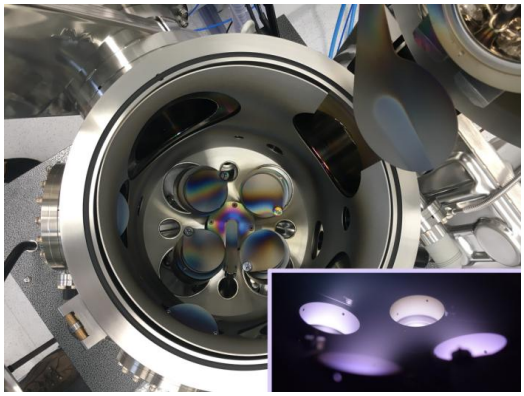
Electricity consumption for computing is becoming a growing problem in today's world: Thus, one of the biggest challenges for solid state physics is to develop physical concepts and technologies to reduce this energy intensity. One possible approach is offered by so-called spintronics, a field that seeks to harness the spin of electrons to perform logical operations and store information. In spintronics the dissipative charge currents causing the increasing power consumption of microelectronics can be replaced by dissipation free spin currents. New materials for spintronics applications, are often explored in the form of thin film compounds, which allows obtaining phases which are not possible otherwise. These only few nanometer thick thin films present a challenge even for the precise determination of their chemical composition.

The precise determination of the chemical composition, however, is a crucial step in the optimization of the single crystal thin film growth by either magnetron sputtering or molecular beam epitaxy (see Figure). The students project therefore would be to test a new method based on wavelength dispersive X-ray fluorescence spectrometry for the chemcial composition determination of thin films. The project will involve performing the measurements and corresponding data analysis by modelling. If desired, the project can be extended to the growth of the spintronics thin film. This project is proposed in collaboration with the Institute of Physics of the CAS. The experiments will be carried out in the Department of Spintronics and Nanoelectronics of the Institute of Physics of the CAS.



Ultra high vacuum magnetron sputtering system with four confocal material sources for compound thin film growth. The insert shows the ignited plasma during thin film deposition.