Materials Chemistry Seminar

Monday, 3:30 pm
April 11, 2016

Room 1315
Chemistry Building

"Rational approaches for novel thermoelectric and strongly-correlated magnetic materials"

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The phenomenon of thermoelectricity is attributed to the interconversion of thermal and electrical forms of energy. We developed a new class of bulk thermoelectric materials based on clathrates with a three dimensional framework comprised of oversized transition metal-phosphorus polyhedral cages that encapsulate guest cations. Transition metal-based clathrates have the following advantages over conventional Si-, Ge-, and Sn-based clathrates: i) a larger variety of framework topologies; ii) a higher tune-ability of the electronic properties via framework substitutions. The correlation between the crystal structure, distribution of the metal and phosphorus atoms over the clathrate framework and thermoelectric properties will be discussed.

Exploration of chemical factors that affect magnetic interactions in solids is one of the major steps in the development of novel magnetic materials. We have developed a synthetic approach that granted access to novel well-crystalline materials containing an infinite Fe-chalcogenide sub-lattice where correlated magnetic interactions are expected. On the example of the solution synthesis of the simplest superconductor, tetragonal iron (II) selenide (β-FeSe), we will consider main advantages and pitfalls of the solution synthesis of superconductors and highly correlated materials.