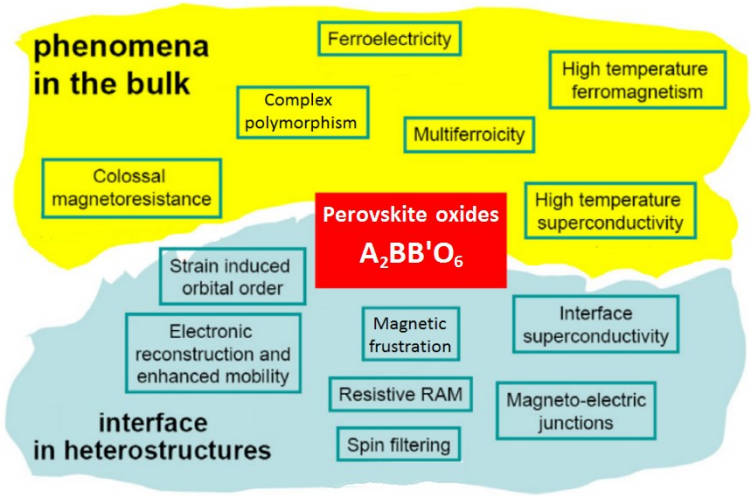
Structural and optical studies of novel, doped A_2CeWO_6 double perovskites

Substituted double perovskites ($2\times ABX_3$ build = $A_2BB'X_6$) have gained an increasing amount of interest recently – since 1950, more than 1000 compounds have met proper requirements for useful applications in photovoltaics via down conversion phenomena. Their polycrystals show promising optoelectronic features and some even more complex polymorphism. Due to the choice of proper A-lkaline and B-site ions (rare-earth or 3d atoms which are prone to valence mixing), one can tailor futuristic materials for upcoming development. Most importantly, thanks to extensive research in the literature [S. Vasala, M. Karppinen, Prog. Solid State Chem. 2015, **43** (1-2), pp. 1-36] various exciting, exotic properties are at hand.

In this family of functional, oxide materials there is a gap in the group of widely-known barium cerates and tungstates which we aim to fill. Original approach would suggest meticulous and careful structural studies using popular spectroscopic (FTIR & Raman) and X-ray techniques (XRD, XAS, XPS) to establish proper composition and overall cation distribution throughout the samples. Only then, photoluminescence and other, extraordinary phenomena like charge-, energy-transfer or persistent phosphorescence could be investigated - the background information about these compounds, in various conditions, would be crucial to understand the physics behind aforementioned processes. High pressure and low temperature studies might be also beneficial in terms of elucidating any additional capabilities like seeking order, tilting, superconductivity, electro-magnetic junction, and producing optical sensors, whereas high-temperatures could be interesting for catalysis, fuel-, and solar cells. This wide range of possible application originates largely from materials exceptional compositional flexibility – chemically they can accommodate almost all of the elements from the periodic table.



Functionalities of perovskite oxides as bulk and interface phenomena.

Partial substitution is also a very common feature – a method of tailoring various unique properties from pure double perovskites. This includes exchanging one of A- or B-site atoms, in many different ways or degrees, what might just cause some spontaneous octahedral tilting or creation of a vacancy to our benefit – there, inside these cuboidal rock-salt compounds, cations share corner space and can erratically expand or contract on a whim. That's why studying these electrooptically active structures via luminescence and spectroscopy is fascinating in much needed nowadays considering rare, blank spots in this field of science.