Project 3.18. Morphological and structural evolution of organic-inorganic metal halide perovskites

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Background:

Metal halide perovskites (MHPs) have emerged as a new class of revolutionary optoelectronic semiconductors promising for various applications. Hybrid organic-inorganic perovskites of the type ABX_3 are ionic crystals based on organic and inorganic components featuring mixed electronic-ionic conduction, and constitute the core element of the newest generation of solar cells. Perovskites undergo a number of phase transitions and their stability and various physicochemical parameters can be continuously tuned by the chemical composition engineering. Nowadays, in regards to the development of modern photovoltaic and photocatalytic systems, a particularly demanding issue concerns the fabrication of halide perovskite micro/nanowires and nano/microtubes of various chemical compositions. The ability to manipulate the composition, morphology and properties of perovskite materials in a controllable manner using the mechanochemical and solution-mediated methods as well as the formation of mixed-cation low dimensional perovskite nanomaterials remains a significant challenge, that yet needs to be explored.

Aim:

We plane to develop mechanochemical processes as an emerging tool for the preparation of highly advanced multicomponent MHP inks. We will also focus on the development of controlled growth of MHP materials with various morphologies including single crystals, nanowires and unprecedented nanotubes/microtubes. These unique nanostructured perovskite materials may open new venue in physico-chemistry of perovskites and optoelectronic devices.

Requirements:

- a university degree in chemistry,
- experience in laboratory work in the field of inorganic and coordination chemistry and/or semiconductor nanomaterials, experience with the use of a Schlenk line, knowledge of spectroscopic methods (FTIR, NMR i UV-Vis), and basics X-ray crystallography.
- good command in English, communication skills and predispositions to work in a team.