DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Title: *Towards novel multicationic halide perovskies and their applications in photovoltaic cells*

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We are witnessing the rapid technological development, which touches almost every area of life. As the result of the dynamic electrical energy consumption growth, the energy supply cannot be provided in the future by the conventional fossil fuels electrical plants. One of the ways to overcome this issue is to use photovoltaic cells – the devices that harvest solar light and turn it into the electricity. Most of them is made of silicon, but the high manufacturing cost is limiting the economical balance of this solution. For that reason new semiconducting materials are required for photovoltaics. The most promising candidates are the halide perovskites, which enabled into the solar cells exhibited quantum efficiencies up to 22,1% in just few years of research. The most prominent materials from this group are consisted of inorganic-organic lead perovskites. Despite good opto-electronic properties of the basic materials, the protoplast material $CH_3NH_3PbI_3$ possesses two main drawbacks, that hamper further commercialization: (a) low stability due to moisture and temperature induced methylamine quaternary amine salt decomposition, (b) high toxicity due to lead content. The stability issue can be overcame by replacing $CH_3NH_3^+$ with other more stable cations, while toxicity can be lowered by substituting lead with less toxic elements.

The main goal of this project is development of new multicationic lead and lead-free halide perovskites. The following materials will be manufactured using applicant's group developed mechanochemical, involving neat grinding of solid substrates. Properties of novel "mechanoperovskites" will be examined by instrumental techniques. Selected materials will be used to manufacture solar cells, to evaluate their application potential.

The presented project gives the opportunity to study the interdependence between chemical composition and physicochemical properties of halide perovskites. The applicant's proposal is highly interdisciplinary research combining the knowledge from chemistry, physics and material engineering. All of the following factors highlights the innovative character of the proposal, which can give the new opportunities to applications of halide perovskties.