Title: Towards novel generation of anodes based on halide perovskites for li-ion batteries

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One of the biggest problems of modern society is efficient energy storage. Initially this issue had been solved by release of energy by burning of wood, coal and crude oil, and sparked the dynamic technology advancements of during 19th century industrial revolution. Another way to solve this issue is direct consequence of 18th century experiments done by L. Galvani and A. Volta about energy storage by chemical oxidation/reduction reactions in a system composed of electrodes submerged in electrolyte solution. The real breakthrough in this area of research occurred in second part of 20th century by discovery of lithium-ion batteries and their commercialization in 1991. This findings were awarded the Nobel Prize in Chemistry for 2019 for prof. J. Goodenough, prof. Whittinghama and prof. A. Yoshino for „the development of lithium ion batteries". This technology allows storage of energy in electrodes by incorporation of lithium cations.

The main project goal is developing new generation of halide perovskite materials for lithium storage technologies. Those materials are group of the most studied semiconductor materials. Their unique physicochemical properties allowed a birth of new generation of solar cells, but their applications is also covering the scope of photocatalysis, luminescent materials and detection of electromagnetic radiation. Halide perovskites are good ionic conductors and possess the ability to lithium storage inside their crystal structure, and this allows to use them as active electrode material in li-ion batteries.

All materials will be prepared using, home designed mechanochemical procedure by grinding of solid state precursors. Physicochemical properties of novel "mechanoperovskites" will be examined by instrumental techniques. Integral part of research will be studies on neat and electrolyte-aged materials. The next step will be focused on electrochemical characterization in the context of applications in Li-ion batteries. 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.