

Perovskite semiconductors have been one of the most intensively studied materials in recent years. This is due to their unique properties, which make these materials extremely promising for both photovoltaic and light emission application. In less than 10 years, solar cells based on perovskites as an active area have achieved efficiency comparable to silicon technology, which has been developed for over 50 years. In addition, perovskites can be synthesized using wet chemistry methods, which significantly reduces the cost of their production; making perovskite based photovoltaic devices much cheaper than a current technology.

Current perovskite rush has led scientists to take an interest in perovskite-derived materials such as two-dimensional perovskites. These materials are natural quantum wells, i.e. quasi 2-dimensional materials, the properties of which can be controlled with remarkable flexibility, making the spectrum of their applications even broader than those of classic perovskites. Another particular feature of perovskite semiconductors is that they are a few to several times softer than silicon or gallium arsenide (semiconductors commonly used today). Interestingly, the "softness" of materials rarely correlates with their good electro-optical properties, which makes perovskites unique.

In this project we want to focus on perovskites softness and how to use it to modify their properties. The deformation of perovskites affects the arrangement of atoms within their lattice and thus changes their properties. Under the influence of stresses or compression, we can control their absorption and emission properties, in other words, what color they have or what is the color of emitted light. Due to the softness of perovskites, the degree of modification of their properties by external factors is much greater than in the case of previously known semiconductors. Moreover, the control of the arrangement of atoms in perovskite structures can be obtained not only by external factors, but also can be imposed by the appropriate selection of components used for their synthesis. The goal of this project is to understand how to use softens of perovskite in tailoring their properties. Full understanding of the properties of these materials may mean that in the future they will change people's everyday lives in a way no less than Silicon, Gallium Nitride or Gallium arsenide.