In the last two decades we witnessed a booming scientific activity on material systems beyond the well-established *classical* semiconductors like silicon, gallium arsenide, or semiconductor heterostructures. These novel materials not only possess intriguing fundamental properties but also show a potential application in opto-electronic devices. Among them we distinguish two-dimensional (2D) layered perovskites, a derivative of bulk perovskite structures. Materials from this group have initially attracted considerable interest as a significantly more stable alternative to their 3D counterparts, while maintaining good performance in photovoltaic and light-emitting applications. Another key advantage of 2D perovskites is related to its fabrication process - materials from this group are synthesized with the methods of wet chemistry which significantly reduces production costs. As a result, the fabrication of a perovskite solar cell can be lower when compared with typical silicon-based devices. The building blocks of perovskite structure: the metal atoms (lead, tin) as well as the halogens (elements from the 17th group of the periodic table) are abundant. The halogen atoms form an octahedron cage with a metal atom inside, and the octahedrons connect with each other forming an inorganic sheet (thus its name, two dimensional perovskites). The structure of 2D perovskite is completed by the organic molecules, which separate the consecutive inorganic layers. Due to the presence of these hydrophobic organic molecules 2D perovskites are in the spotlight of researches from around the world - their stability with respect to the environmental conditions is greatly enhanced when compared to the corresponding 3D variants and thus the application of these materials in opto-electronic devices is greatly anticipated. Moreover, as a result of layered structure 2D perovskites are also known for their great design's flexibility. The organic spacers separating the inorganic sheets can be chosen from a vast list of options, affecting the properties of the resulting material. Such a powerful tuning factor is unusual even for semiconductors. From this point of view 2D perovskites can be utilized as a building block of many technologies such as communication, sensing, electronics, computing, lightening and energy harvesting.

However, similar to 3D perovskites, the deployment of 2D perovskites in opto-electronic devices is outpacing the understanding of its fundamental properties. The large organic spacers grant access to (almost) infinite material engineering possibilities not accessible in fully inorganic materials. The multitude of available variants of 2D perovskites means that, with a high probability, it is possible to discover a material that will contradict the knowledge about semiconductors obtained so far. One of such rules is the principle that the lowest energy state of an exciton is the optically inactive state (the so-called dark state), and the optically active state (bright state) has larger energy. This hierarchy is followed in most semiconductors, and materials that break this rule are considered ideal light emitters.

The aim of this project is to investigate whether 2D perovskites break the above rule and to determine the possibility of controlling the hierarchy of energy states through material engineering. The ability to control the hierarchy of states by means of material engineering has not yet been explored for 2D perovskites. If the lowest energy state is optically inactive in a material, the based upon device may be exposed to a loss of efficiency - the dark state does not allow for effective light emission (hence its name). Since the dark state of an exciton is not usually observed, an external magnetic field generated by a strong magnet will be used to make it visible. The magnetic field brightens the dark state, allowing its observation and determining its position with respect to the bright state. Information about the mutual arrangement of these two energy states is crucial from the point of view of using these materials in optoelectronic devices of the future.