Towards Electrostatically Gated Perovskite Thin Films

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Perovskite semiconductors are widely studied in the context of solar light harvesting used for photovoltaic applications, but less in the context of their fundamental physical properties. As a medium exhibiting strong light-matter coupling, they may constitute an interesting platform for optoelectronics and opto-spintronics in particular.

Our long-term goal is to study spin dynamics in those materials to explore their potential applications in opto-spintronics. For that, we need to control the charge density in studied structures in a reliable way.

Here we present our efforts in the fabrication of electrostatically gated perovskite thin film encapsulated in hexagonal boron nitride - needed for the protection of the perovskite material from contamination and degradation. The electrostatic gating in the proposed van der Waals heterostructure is performed with the use of a graphene flake making and electrical contact with the perovskite film, as shown in Figure 1.

In our approach we modify the methods widely applied for the fabrication of transition metal dichalcogenide (TMD) structures, not only to obtain perovskite structures of high optical quality, but also to exploit the possibility to combine them with TMD materials in the future.

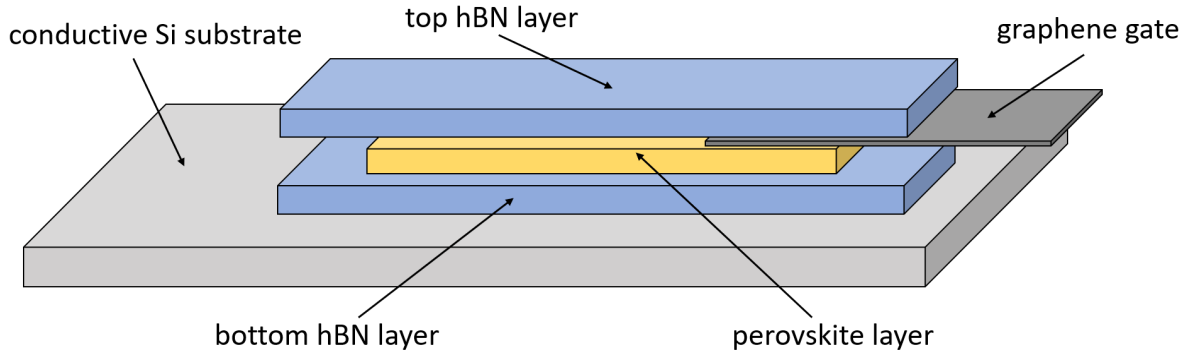

Figure 1: A schematic of perovskite thin film encapsulated between hexagonal boron nitride (hBN) slabs, electrostatically gated via graphene flake.