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Gate-controlled Two-dimensional materials

Two-dimensional (2D) atomic crystals, best exemplified by graphene, have emerged as a new class of material that may impact future science and technology. Our group at Fudan University has been actively exploring new 2D materials with peculiar electronic properties. In this talk I will discuss two 2D materials that we found particularly interesting – black phosphorus and 1T-TaS₂. These two layered materials have vastly different properties. Black phosphorus is a 2D semiconductor, and its superior material quality has recently enabled us to observe the integer quantum Hall effect. 1T-TaS₂, on the other hand, is a metal with a rich set of charge density wave phases. We explore their electronic properties while the doping and dimensionality of the 2D systems are modulated.

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