The interfacial transport of 2D layered semiconductor investigated by scanning probe microscopy approach

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2D layered transition metal dichalcogenides (TMDs) with the chemical formula MX_2 (where M=group IVB-VIIB metal and X=chalcogen) have brought new possibility for the applications in ultralow-power electronics than the zero-bandgap graphene. However, their low carrier mobilities at ambient conditions have limited their practical applications. Therefore, many researchers are paying much attention on seeking and synthesizing new member of the 2D TMDs.[1] In the same time, some researchers are trying to further explore the carrier transport mechanism enabling to design new electronics.[2] Except metallic and insulate property, many 2D layered materials exhibit semiconducting behavior including n-type, p-type or ambipolar, which could be used to fabricate various electronics. Compared with unipolar (n-type or p-type) transistors, ambipolar transistors, which can easily switch between n-type and p-type behavior by applying an electric field, are most promising candidates since they can effectively simplify circuit design and save the layout area in CMOS.

In this presentation, scanning probe technique including electric field microscopy, kelvin probe force microscopy and current atomic force microscopy, will be introduced to study the local electronic property of 2D layered semiconductor. The surface potential, aligned energy band in p-n junctions and local carrier transport property of CVD-grown $PtSe_2$ will be talked.[3] Furthermore, the dimensionality dependent ambipolar WSe_2 will be introduced from locally field screening and tuned work function under external electric field.

References:

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