Tuning the Schottky barrier of two-dimensional lateral heterostructure by strain engineering

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It has been know that Schottky barrier (SB) formed at Metal-semiconductor junction is one of the very important key parameters determining modern electronic device performance and efficiency. Recently, two-dimensional (2D) transition metal dichalcogenides have emerged among the hottest classes of materials owing to their promising properties for future applications. Compared with their bulk counterparts, 2D materials can sustain much higher elastic strain up to 10%. Here, using density functional theory, we find that the SB height (formed at semiconducting MoS_2 and ferromagnetic metal VS2) is spin dependent and tunable by about 0.1 eV due to the uniaxial strain. We expect these strained lateral heterostructures can be a promising 2D-based rectifying device such as transistor, diode and spintronics.

Keywords : Density functional theory, spin-dependent Schottky barrier, uniaxial strain, MoS_2, VS_2