

SPM studies on functionalization of 2D transition metal dichalcogenides

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Transition metal dichalcogenides (TMDs) are a new class of layered materials developed¹ following the discovery of novel physical properties of graphene. Based on their composition and crystal structure TMDs can exhibit a wide range of electronic behavior from semiconducting to semimetallic, metallic and sometimes superconducting². Tunability of the electronic bandstructure in these materials thus becomes important. Functionalization by covalent and non-covalent approach is a promising approach to effectively modify the electronic band gap, Fermi level position and induce doping in these materials³. In this work we will discuss about visualization of functionalized TMDs with scanning probe microscopy (SPM) techniques. We have carried out controlled covalent functionalization of TMDs by aryl diazonium chemistry which results in the formation of covalent bonds between for instance MoS₂ and diazonium compounds. The grafted molecules on the TMDs are visualized using STM and AFM in ambient conditions. Additionally Raman and X-ray photoelectron spectroscopy were used to understand the impact of functionalization on the electronic properties of TMDs.

References

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