

# **Inhomogeneous hysteresis in local STM tunnel conductance with gate voltage in single layer MoS<sub>2</sub> on SiO<sub>2</sub>**

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Charge traps at the MoS<sub>2</sub>/SiO<sub>2</sub> interface result in non-ideal transport behavior, including hysteresis in MoS<sub>2</sub> on SiO<sub>2</sub> FETs. Our room temperature STM/S measurements in vacuum on atomically resolved single and few-layer MoS<sub>2</sub> on SiO<sub>2</sub> show n-doped behavior with the expected band gap close to 2.0 and 1.4 eV, respectively. The local tunnel conductance with gate-voltage V<sub>g</sub> sweep exhibits a turn-on or off at a threshold V<sub>g</sub>. This threshold value is found to depend on V<sub>g</sub> sweep direction amounting to local hysteresis. This hysteresis is, expectedly, found to depend on both the extent and rate of V<sub>g</sub>-sweep. Further, the spatial variation in the local threshold V<sub>g</sub> value and the detailed conductance V<sub>s</sub> V<sub>g</sub> behavior indicate inhomogenities in both the traps' density and their energy distribution. Further, while most of the single layer MoS<sub>2</sub> was found to be n-doped, some rare locations exhibit a p-doping with both p and n-type V<sub>g</sub>-thresholds in local conductance and an unusual hysteresis.