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Local Raman spectroscopic fingerprints of TMDC-metal interactions

Metal-mediated exfoliation of TMDCs has recently attracted considerable interest due to high yields of large size monolayer flakes [1]. The van der Waals interaction between metals and TMDCs enables the exfoliation of large size monolayers but also alters their properties due to strain and charge doping.

First, the exfoliation of large-area monolayers on different metals (Au, Ag, Pt, Pd, Cu, Ni, Co, Cr, and Ti) will be presented, where the nobility of the metal was correlated with the size of the exfoliated MoS₂ [2]. The oxidation levels were studied with XPS, while the effects of strain and charge doping are explained with Raman spectroscopy measurements.

In the second part an in-depth study of the strain and charge doping fingerprints of the strong interaction between monolayer MoS₂ and Au will be presented [3]. The interaction with different types of Au (e-beam evaporation, magnetron sputtering, thermal evaporation, single crystal Au (111)) was studied with AFM, Raman spectroscopy, TERS, and XPS. The strength and the heterogeneity of the MoS₂-Au interaction, strongly correlates with the Au roughness and was confirmed with nanoscale TERS mapping. The TMDC-Au interaction is also evidenced by the appearance of additional, otherwise forbidden Raman modes, and it can be modulated by the force set-point of the TERS tip [4].

References

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