Advances in room temperature 2D ferromagnets

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Recently-discovered two-dimensional ferromagnetic materials (2DFMs) have rapidly gained much interest in the scientific community. Such materials are potentially transformative in the fields of spintronics and computing, where they may prove powerful tools for miniaturizing devices such as magnetic tunnel junctions and spin-transfer torque memory bits. In addition, heterojunctions and twisted bilayer stacks of such materials may yield interesting and exotic spin textures. However, preparation of such devices is complicated by the air sensitivity of many 2DFMs. Here, we report our progress on the preparation of few-to-monolayer flakes of in-plane ferromagnet vanadium selenide (VSe_2) using electrochemical exfoliation, a detailed study of the change in both surface topology and ferromagnetic properties of VSe_2 in air after different levels of surface passivation, and work towards developing an AFM technique for specifically imaging lateral magnetic fields.

FIGURES

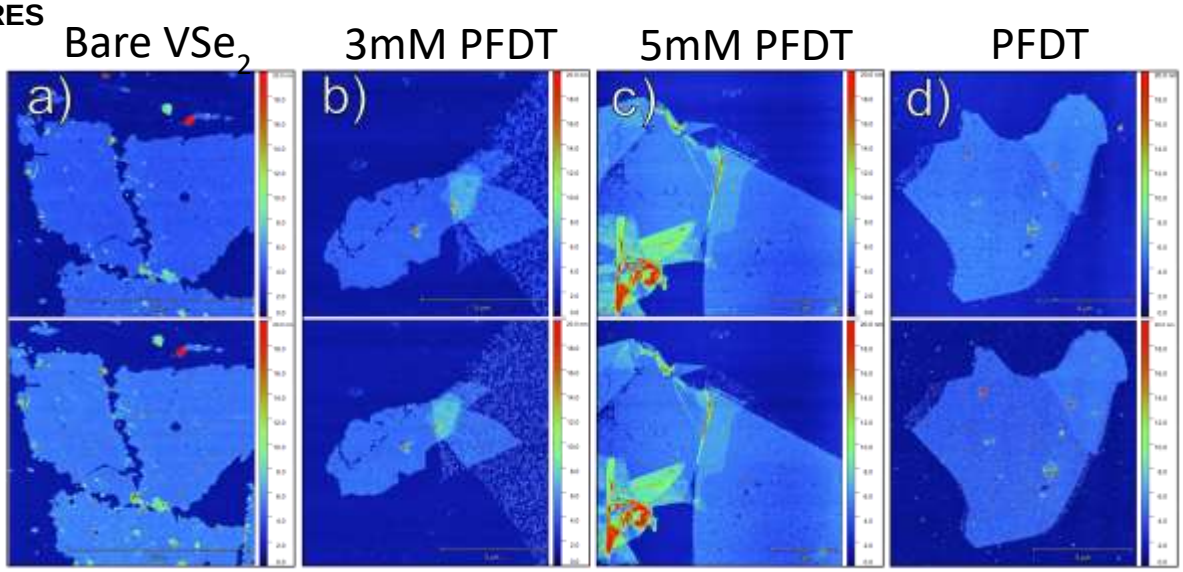

Figure 1: AFM time-series with different concentrations of perfluorodecanethiol (PFDT) surface treatment in ethanol shows that for few-layer VSe_2, concentrations as low as 3mM of PFDT in ethanol prevent oxidation just as well as pure PFDT.