ICFO

SEMINAR: Ultra-High Vacuum Heterostructure Fabrication

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15:00 to 16:00
Seminar Room

The 2D materials library has rapidly expanded from graphene to include many other materials. As the complexity of heterostructure devices has increased, one of the main obstacles to progression is the ability to fabricate large area heterostructures that are free from interlayer contamination. Additionally, many 2D materials including magnetic 2D materials face further fabrication complications due to their degradation in ambient conditions. As such, they are less well characterised than most despite having a large number of potential applications. Materials such as Cr2Ge2Te6 and CrI3 have been shown to be ferromagnetic down to the few layer limit. However, detailed investigation into the crystallographic and electronic properties of such materials, especially of monolayer samples, has been limited due to the difficulty of fabricating clean monolayer samples.
This talk presents novel techniques for the fabrication of 2D heterostructures in ultra-high vacuum (UHV) conditions, using a polymer free transfer technique. The full fabrication process, including the exfoliation of materials is carried out in the UHV environment. This technique is capable of producing. This allows for the fabrication of heterostructures without trapped contamination. The benefits of the technique are demonstrated through the fabrication of several samples of air sensitive materials. The results show that UHV fabrication produces clean, high-quality devices showcasing its advantages for the fabrication of samples from highly sensitive materials.

Wang, W., Clark, N., Hamer, M. et al. Clean assembly of van der Waals heterostructures using silicon nitride membranes. Nat Electron **6**, 981-990 (2023).
https://doiorg.manchester.idm.oclc.org/10.1038/s41928-023-01075-y

Hosted by: Prof. Dr. Frank Koppens