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Super-clean graphene film: synthesis, transfer and applications

Abstract
The atomically thin two-dimensional nature of suspended graphene membranes holds promising in numerous technological applications. In particular, the outstanding transparency to electron beam endows graphene membranes great potential as a candidate for specimen support of transmission electron microscopy (TEM). However, major hurdles remain to be addressed to acquire an ultraclean, high-intactness, and defect-free suspended graphene membrane. Here, we have achieved a polymer-free clean transfer of sub-centimeter-sized graphene single crystals onto TEM grids to fabricate large-area and high-quality suspended graphene membranes. Through the control of interfacial force during the transfer, the intactness of large-area graphene membranes can be as high as 95%, prominently larger than reported values in previous works. Graphene liquid cells are readily prepared by π-π stacking two clean single-crystal graphene TEM grids, in which atomic-scale resolution imaging and temporal evolution of colloid Au nanoparticles were recorded. This facile and scalable production of clean and high-quality suspended graphene membrane is promising towards their wide applications for electron and optical microscopy.

References

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Figures

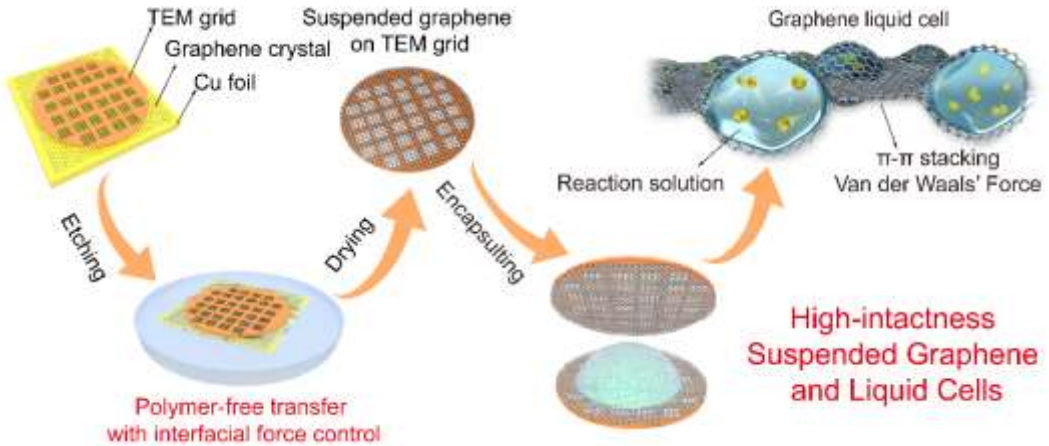

Figure 1: Schematic illustration of the procedures from clean transfer of graphene single crystals to fabrication of graphene liquid cells