Seminar

Self-assembly of graphene ribbons on a substrate at the micrometer scale

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地点：北京大学物理楼，西563会议室

Abstract

We discuss the large-scale self-assembly of graphene ribbons we recently discovered for surface adhered sheets exfoliated onto silicon oxide substrates [1]. Directed folding of flap-like structures seeds growth of long ribbons that spontaneously peel and tear the sheet as they slide in superlubricous fashion. We observe ribbon growth up to 20 micrometers in size in ambient conditions. Measurement of ribbon velocity versus width in a slow growth regime reveals a logarithmic dependence consistent with thermally-activated bond dissociation. Our analysis suggests this form of self-assembly may be a general phenomenon common to a large class of 2D materials.

We present a theoretical treatment of the phenomena based an energy minimization analysis technique originally applied to macroscopic tearing of adhered sheets. The analysis predicts a driving force proportional to ribbon width based on self-affinity of the graphene relative to the substrate, and suggests the phenome may be general for any thermally activated sheet.

[1] Annett J., Cross, G. L. W., Self-assembly of graphene ribbons by spontaneous self-tearing and peeling from a substrate, *Nature* 535, 271-275, (2016).

About the Speaker

Graham L. W. Cross is a professor of physics at Trinity College in Dublin and a PI at Trinity's CRANN Nanotechnology Centre. Graham completed a doctorate in physics at McGill University, Canada, and then took a position with IBM Research in Zurich.

As a faculty member of Trinity College Dublin, Graham has built a research group concentrated on the nanoscale mechanical behaviour of matter. He has also spun out a company Adama Innovations in 2014 dedicated to the production of diamond NEMS. He is currently expanding these techniques to fabricate roll-to-roll (R2R) roller nanoimprint dies for advanced deterministic 3D nano-manufacturing of tissue scaffolds via additive lamination.