

Monolayer Amorphous Carbon: Perfect Disorder in the 2D Limit

B. Oezylimaz, National University of Singapore

Bulk amorphous materials have been studied extensively and are widely used, yet their atomic arrangement remains an open issue. In two-dimensional materials, however, the corresponding question is easier to answer. I will discuss the synthesis, by laser-assisted chemical vapour deposition, of centimetre-scale, free-standing, continuous and stable monolayer amorphous carbon, topologically distinct from disordered graphene. Unlike in bulk materials, the structure of monolayer amorphous carbon can be determined by atomic-resolution imaging. Extensive characterization by Raman and X-ray spectroscopy and transmission electron microscopy reveals the complete absence of long-range periodicity and a threefold-coordinated structure with a wide distribution of bond lengths, bond angles, and five-, six-, seven- and eight-member rings. The ring distribution is not a Zachariasen continuous random network but resembles the competing (nano)crystallite model. I will also discuss its potential use as ultra-low k dielectric to overcome scaling challenges of Si CMOS and beyond Si CMOS.