Towards Single Crystal Graphene by Chemical Vapor Deposition

Wafer-scale single-crystalline graphene monolayers are highly sought after as an ideal platform for electronic and other application. Chemical vapor deposition (CVD) has been proved as a low-cost and high-quality approach to grow graphene film. Unfortunately, only polycrystalline graphene film with grain size around hundreds micrometers can be delivered using current CVD technology. In this seminar, Dr. Yu will present his efforts on the growth of wafer-scale single-crystalline graphene. He will demonstrate the growth of single-crystalline graphene array by patterning seeds on Cu substrate. He will also demonstrate an efficient strategy for achieving large-area single-crystalline graphene by letting a single nucleus evolve into a monolayer at a fast rate. By locally feeding carbon precursors to a desired position of a substrate composed of an optimized Cu–Ni alloy, a ∼1.5-inch-large graphene monolayer was grown in 2.5 h. Localized feeding induces the formation of a single nucleus on the entire substrate, and the optimized alloy activates an isothermal segregation mechanism that greatly expedites the growth rate. This approach may also prove effective for the synthesis of wafer-scale single-crystalline two-dimensional materials.