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Graphene Crystal Growth and Device Integration

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Graphene has unique electronic, chemical, thermal and physical properties and this is opening many opportunities for its use. However, to date the majority of the experiments have been performed on exfoliated graphene. There is a need to develop high quality, large area single crystal graphene for electronic applications. The discovery of graphene growth copper by chemical vapor deposition (CVD) has led to the growth of polycrystalline large area (square meters) films. The domain size for the baseline process is a few tens of microns in diameter but large “crystals,” 0.25 square mm, have been grown. However, even though the films are not yet fully single crystals the transport properties are equivalent to those of exfoliated graphene. The ultimate usefulness of any material for electronics is the ability to integrate it with dielectrics and metals. Graphene is chemically inert and will require special processes to integrate it with dielectrics and metals without interrupting its band structure. The objective of this presentation is to review and present new data on large area graphene crystal growth and integration of dielectrics and metals. Surface analysis of graphene with dielectrics and metals under various processing conditions will also be presented.