Engineered Flexible Conductive Barrier Films for Advanced Energy Devices

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Flexible barrier films preventing material degradations are important for many industries especially for advanced energy devices. From this point of view, graphene and other 2 dimensional (2D) materials have recently attracted particular attention since its defect-free monolayers are known to be impermeable to all types of atoms and molecules. However, it has been proved to be challenging to develop defect-free 2D films over large area suitable for industrial use and there still exists many obstacles to overcome towards commercialization. This presentation exploits unusual strategies to develop large-area 2D films and investigate them in a facile, scalable manner for potential applications. We have developed an efficient characterization technique to observe all possible microscopic topological defects of different origins and an effective passivation method of various graphene defects using an electron beam induced carbon in macro-scale. We will also present on-going research at UNIST, especially on the applications of graphene and other 2D materials as flexible barrier films and functional coatings in advanced energy devices.