Graphene Encapsulation for Stretchable Displays

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The use ofgraphene as a transparent electrode has already been demonstrated in a varietyof flexible optoelectronic devices, including touch-screen sensors, organiclight-emitting diodes and organic photovoltaic devices. Inaddition, graphene's outstanding gas-barrier properties areintensively investigated to develop an encapsulation layer for various flexibledisplay and energy devices. Preventing reactive gas species such as oxygen orwater is important to ensure the stability and durability of organicelectronics. Although inorganic materials have been predominantly employed asthe protective layers, their poor mechanical property has hindered thepractical application to flexible electronics. The densely packed hexagonallattice of carbon atoms in graphene does not allow the transmission of smallgas molecules. In addition, its outstanding mechanical flexibility and opticaltransmittance are expected to be useful to overcome the current mechanicallimit of the inorganic materials. In this talk, the practical measurement ofthe water vapor transmission rate (WVTR) of large-area graphene filmssynthesized by chemical vapor deposition (CVD) will be discussed first. In addition, the graphene-passivated organic electronic devices that exhibitexcellent environmental stability as well as a prolonged lifetime with extrememechanical flexibility and stretchability will be presented.