Wearable Electronics Using Graphene Hybrid Nanostructures

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Wearable electronics is an important area of future electronics. Stretchable and flexible transparent electrodes are required to form wearable displays and touch screen panels with comfort designs. Conductive transparent materials have been intensively studied to replace conventional indium tin oxide (ITO) due to its limited supply and rigidity. Especially, graphene and metal nanowire (NW) random networks have attracted considerable attentions due to their high transparency and conductivity comparable to properties of the ITO electrodes. Metal nanowire networks can be simply formed through solution processes and have lower sheet resistances than the resistances of undoped synthesized graphene. However, the nanowire networks have critical disadvantages such as high inter-nanowire junction resistances, low breakdown voltages, and high contact resistances with other active materials. Here, we present the formation of the graphene-metal nanowire hybrid films as transparent and flexible electrodes. These hybrid films show low sheet resistance (~30 Ω/sq), high transmittance (94 % at 550 nm wavelength), and outstanding mechanical stretchability (maximum tensile strain of 100 % with negligible resistance change).