Chemically Modified Carbon Nanostuctures for Advanced Optoelectronics and Catalysis

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Graphitic carbon mateirals, including carbon nanotubes and graphene, possess outstanding properties arising from the honeycomb sp^2 hybrid carbons. Nevertheless, such a stable chemical structure makes it hard to modify the properties into a desired way. In this presentation, our recent achievements associated to the modulation of materials properties of graphitic carbon materials via B- or N-doping and its application to high performance optoelectronics and catalysis will be introduced. Nitrogen with one more valence electron than carbon enhances the electron density of graphitic carbon plane, while boron with one less valence electron reduces the electron density. Such modulation of carrier density allows the tunability of workfunction and electrical conductivity. B- & N- doping also enhances the surface energy and, moreover, plays the role of nucleating site for mineral or metal deposition to yield nanocomposite structures. The resultant chemically modified graphitic carbon materials and their nanocomposites are widely utilized for high performance optoelectronics and catalysis.