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A Versatile p-type Dopant for High-performance Flexible Graphene Transparent Electrode and its Application in Optoelectronic Devices

BCF is a novel strong p-type dopant for fabricating high-performance flexible graphene TCF, which is superior to current versatile p-dopants in terms of both doping intensity and stability. Particularly, doping with 10 mM BCF reduces the sheet resistance of monolayer graphene film by 70% with an unexpected transparency increase of 0.7%, and also improves the work function to 5.0 eV. It shows distinct advantage in improved ambient doping stability as compared to the common dopants such as HNO₃, which arises from the higher binding energy of BCF to graphene. We further demonstrate the BCF-doped graphene is an effective anode for high-performance OLED and graphene/Si Schottky junction solar cells that exhibit improved power conversion efficiency and stability. As a result of the higher work function and lower sheet/series resistance by stable BCF doping, it enables not only higher optoelectronic performances but also higher ambient stability than the typical HNO₃-doped devices.