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Graphene oxide-based transparent conductive films

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ABSTRACT

The exciting features in almost all modern portable and house-hold electronics are driven by optoelectronics that extensively use transparent conductive films (TCFs) in components, such as touch screens, liquid crystal displays, organic photovoltaic cells and organic light-emitting diodes. Because of its excellent electrical conductivity, optical transparency and mechanical properties, graphene has been considered an ideal material to replace the existing, expensive indium tin oxide (ITO) as TCFs. Graphene oxide (GO) in the form of colloidal suspension is not only scalable for high volume production at low costs, but also compatible with emerging technologies based on flexible substrates. This paper reviews the current state-of-the-art developments and future prospects of TCFs synthesized using GO suspension. In addition, several established approaches are introduced, which have been proven effective in improving the optoelectrical performance of GO-based TCFs. They include chemical doping treatments, use of large size GO sheets, and hybrids with other nanostructured materials, such as carbon nanotubes (CNTs), metal nanowires (NWs) or nanogrids.

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Contents

Nomenclature

Acronyms

AFM	atomic force microscopy
BA	benzylamine
BDM	bubble deposition method
CGOWs	concentrated graphene oxide wrinkles
CMOS	complementary metal–oxide–semiconductor
CNT	carbon nanotube
CVD	chemical vapor deposition
DC	direct current
DCB	o-dichlorobenzene
DCE	dichloroethane
DMA	dimethylacetamide
DMF	N,N-Dimethylform
EBA	ethylbenzoic acid
EPD	electrophoretic deposition
EFG	edge selective functionalization of graphite
FTO	fluorine tin oxide
GNP	graphite nanoplatelet
GO	graphene oxide
HF	hydrogen floride
HI	hydrogen iodine