Graphene based flexible electrochromic devices

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Abstract

Graphene emerges as a viable material for optoelectronics because of its broad optical response and gate-tunable properties. For practical applications, however, single layer graphene has performance limits due to its small optical absorption defined by fundamental constants. Here, we demonstrated a new class of flexible electrochromic devices[1] using multilayer graphene (MLG) which simultaneously offers all key requirements for practical applications; high-contrast optical modulation over a broad spectrum, good electrical conductivity and mechanical flexibility. Our method relies on electro-modulation of interband transition of MLG via intercalation of ions into the graphene layers. The electrical and optical characterizations reveal the key features of the intercalation process which yields broadband optical modulation up to 55 per cent in the visible and near-infrared. We illustrate the promises of the method by fabricating reflective/transmissive electrochromic devices and multi-pixel display devices. Simplicity of the device architecture and its compatibility with the roll-to-roll fabrication processes, would find wide range of applications including smart windows and display devices. We anticipate that this work provides a significant step in realization of graphene based optoelectronics.

References

[1] Emre O. Polat, Osman Balci, Coskun Kocabas. Scientific Reports, **4** (2014) 6484.

Figures