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Electrochromic Device for the Reflective Type Display Using Reversible Electrodeposition System

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The green displays are the human friendly displays, the nature friendly displays, and the economical displays. Electrochromic displays are low cost and environmental devices because they do have more choice of colours and use much less power. The elements of the electrochromic devices consist of at least two conductors, an electrochromic material and an electrolyte. The optical properties were obtained using the optical contrast between the transparency of the substrate and the coloured state of the electrochromic materials. These devices can be fully flexible and printable. Due to the characteristics of the high coloration efficiency and memory effects, the electrochromic devices have been used in various applications such as information displays, smart windows, light shutters and electronic papers. Among these technical fields switchable mirrors have been received much attention in the applicative point of view of various electronic devices production. We have developed a novel silver (Ag) deposition-based electrochromic device for the reversible electrodeposition (RED) system. The electrochromic device can switch between transparent states and mirror states in response to a change in the applied voltage. The dynamic range of transmittance percent (%) for the fabricated device is about 90% at 550 nm wavelength. Also, we successfully fabricated the large area RED display system using the parted electrochromic cells of the honey comb structure.

Keywords: electrochromic device, reversible electrodeposition (RED), large area RED display, partition cell, honey comb structure

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Vertically Standing Graphene on Glass Substrate by PECVD

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Since its discovery in 2004, graphene, a sp2-hybridized 2-Dimension carbon material, has drawn enormous attention. A variety of approaches have been attempted, such as epitaxial growth from silicon carbide, chemical reduction of graphene oxide and CVD. Among these approaches, the CVD process takes great attention due to its guarantee of high quality and large scale with high yield on various transition metals. After synthesis of graphene on metal substrate, the subsequent transfer process is needed to transfer graphene onto various target substrates, such as bubbling transfer, renewable epoxy transfer and wet etching transfer. However, those transfer processes are hard to control and inevitably induce defects to graphene film. Especially for wet etching transfer, the metal substrate is totally etched away, which is horrendous resources wasting, time consuming, and unsuitable for industry production. Thus, our group develops one-step process to directly grow graphene on glass substrate in plasma enhanced chemical vapor deposition (PECVD). Copper foil is used as catalyst to enhance the growth of graphene, as well as a temperature shield to provide relatively low temperature to glass substrate. The effect of growth time is reported that longer growth time will provide lower sheet resistance and higher VSG flakes. The VSG with conductivity of 800 Ω/sq and thickness of 270 nm grown on glass substrate can be obtained under 12 min growing time. The morphology is clearly showed by SEM image and Raman spectra that VSG film is composed of base layer of amorphous carbon and vertically arranged graphene flakes.

Keywords: Graphene, Plasma Enhanced Chemical Vapor Deposition (PECVD)