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솔-젤 스핀 코팅에 의해 증착된 텅스텐 산화물 박막의 반응 온도에 따른 전기변색특성 연구

The electrochromic properties of tungsten oxide thin films coated by a sol-gel spin coating under different reactive temperature

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Electrochromism (EC) is defined as a phenomenon in which a change in color takes place in the presence of an applied voltage. Because of their low power consumption, high coloration efficiency, EC devices have a variety of potential applications in smart windows, mirror, and optical switching devices. An EC devices generally consist of a transparent conducting layer, electrochromic cathodic and anodic coloring materials and an ion conducting electrolyte. EC has been widely studied in transition metal oxides(e.g., WO_3, NiO, V_2O_5)

Among these materials, WO_3 is a most interesting material for cathodic coloration materials due to its high coloration efficiency (CE), large dynamic range, cyclic reversibility, and low cost material. WO_3 films have been prepared by a variety of methods including vacuum evaporation, chemical vapor deposition, electrodeposition process, sol-gel synthesis, sputtering, and laser ablation. Sol-gel process is widely used for oxide film at low temperature in atmosphere and requires lower capital investment to deposit large area coating compared to vacuum deposition process.

In this study, electrochromic properties of WO_3 film were investigated under different preparing temperature condition. The results indicate that electrochromic properties of the sol-gel WO_3 film has fast response time and large transmittance change. Fig. 1 shows electrochemical properties of sol-gel WO_3 film in the condition of different reactive temperature. The structure, composition and morphology of WO_3 film analyzed using X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), X-ray photoelectron spectroscopy (XPS). The electrochemical behaviors of each film were investigated by cyclic voltammtry and chronoamperometry. The optical transmittance was simultaneously measured *in-situ* during all experiments by using He-Ne laser.

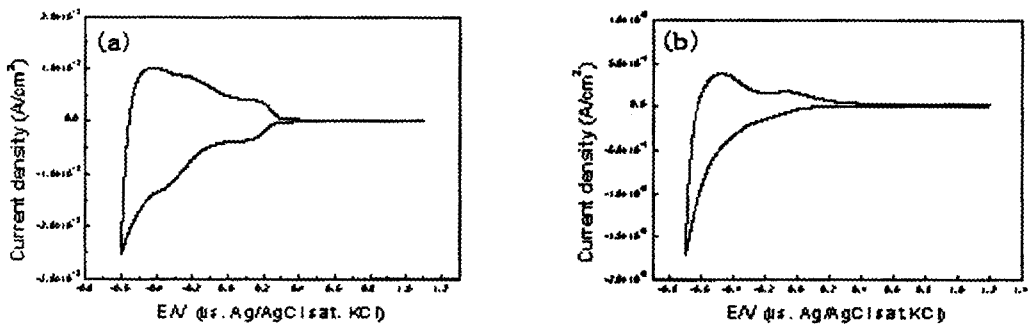

Fig. 1 Electrochemical properties of tungsten oxide by preparing sol under different temperature condition ; (a) 70℃ (b) 25℃