

## Optical and Electrochromic Properties of All-Solid-State Electrochromic Device Consisting of Amorphous WO<sub>3</sub> and Ni(OH)<sub>2</sub>

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**Abstract :** Electrochromism refers to the persistent and reversible change of optical properties by an applied voltage pulse. There are many transition metal oxides exhibiting electrochromism, e.g. oxides of W, Ni, Ir, V, Ti, Co and Mo. Organic materials especially some conducting polymers such as poly(aniline), poly(3, 4-propylene- dioxythiophene) also received much attention for electrochromic (EC) applications. Electrochromic materials attract considerable interest because of their potential applications, such as information displays, smart windows, variable reflectance mirrors, and variable-emittance thermal radiators. In this study, the EC characteristics are investigated on an all-solid-state EC device composed of a-WO<sub>3</sub> and Ni(OH)<sub>2</sub> with a Ta<sub>2</sub>O<sub>5</sub> protective layer which is prepared by magnetron sputtering. It is found that the transmittance modulation increases with decreasing the film thickness of Ta<sub>2</sub>O<sub>5</sub>. On the other hand, the transmittance modulation is 57% as the Ni(OH)<sub>2</sub>/ITO is prepared by the linear-sweep potential cycling of the sputter-deposited Ta<sub>2</sub>O<sub>5</sub>/NiO/ITO in a 0.5 M LiClO<sub>4</sub>+H<sub>2</sub>O electrolyte. However, when Ni(OH)<sub>2</sub>/ITO is prepared by a 0.01 M HCl electrolyte, the transmittance modulation of EC device can be improved to 61%.

**Keywords :** electrochromic device, tungsten oxide, nickel, Ta<sub>2</sub>O<sub>5</sub>

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