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Effects of Phase and Morphology on the Electrochemical and Electrochromic Performances of Tungsten Oxide and Tungsten-Molybdenum Oxide Nanostructures

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Abstract : We present the electrochemical and electrochromic performance of the novel crystalline tungsten oxide and tungsten-molybdenum oxide nanostructures synthesized by utilizing solvo-thermal method with hexacarbonyl tungsten, hexacarbonyl molybdenum, and ethyl alcohol. The morphology and phase of the prepared products were highly dependent on the synthesis conditions such as synthesis and annealing temperature, synthesis time, and precursor ratio. The tungsten oxide nanostructures (TCNs) have urchin-like or spherical nanostructure with different phase of W18O49 and WO3. The morphology of tungsten-molybdenum oxide nanostructures (TMONs) is basically similar to that of TCNs. However, the morphology and phase of TMONs are more diverse and are strongly dependent on the composition ratios of W/Mo in the precursor. The electrochemical properties depending on their morphologies and phases of TCNs and TMONs are compared using cyclic voltammetry and galvanostatic charge/discharge tests. The relationship between the electrochromic performance and phase structures/morphologies of nanostructured TCNs and TMONs are systematically investigated.

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