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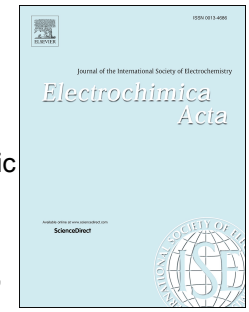

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Enhanced electrochromism in short wavelengths for NiO:(Li, Mg) films in full inorganic device ITO/NiO:(Li, Mg)/Ta_2O_5/WO_3/ITO

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Abstract:

Great interest has been drawn to the electrochromism demonstrated by inorganic materials, leading to various applications including smart windows and displays. NiO, as a cheap material, shows anodic electrochromism and is highly suitable for device applications in conjunction with WO_3, but its strong optical absorbance has been largely overlooked. Herein, improved electrochromic properties in particular in short wavelengths was achieved by co-doping of Mg and Li in NiO:(Li, Mg) thin films grown using RF sputtering. Secondary Ion Mass Spectroscopy technique in combination with X-ray Photoelectron Spectroscopy characterization provides direct evidence of the introduction of Mg as well as Li in the film. Whatever the Li and Mg content, X-Ray Diffraction and Raman spectroscopy studies only bring out the NiO face-centered cubic rock salt structure. Electrochemical cycling shows pronounced anodic electrochromism for NiO:(Li, Mg) thin films. Inorganic all-solid-state monolithic multilayered devices are traditionally composed of a pair of electrodes with NiO and WO_3 separated by Li containing electrolyte such as $LiTaO_3$ or $LiNbO_3$ sputtered from expensive but low efficient ceramic targets. Based on optimal NiO:(Li, Mg) films, large switchable electrochromism both in visible (~58%) and ultraviolet band (~50%) is reconciled in electrochromic device Glass/ITO/NiO:(Li, Mg)/Ta_2O_5/WO_3/ITO. The co-doping of NiO with Mg and Li is capable of simultaneously widening the gap and avoiding the use of Li containing electrolyte, through NiO pre-lithiation. We believe the new, low-cost approach would provide references with respect to practical applications desired for their successful