

Stabilizing Hybrid Electrochromic Devices through Pairing Electrochromic Polymers with Minimally Color-Changing Ion-Storage Materials Having Closely Matched Electroactive Voltage Windows

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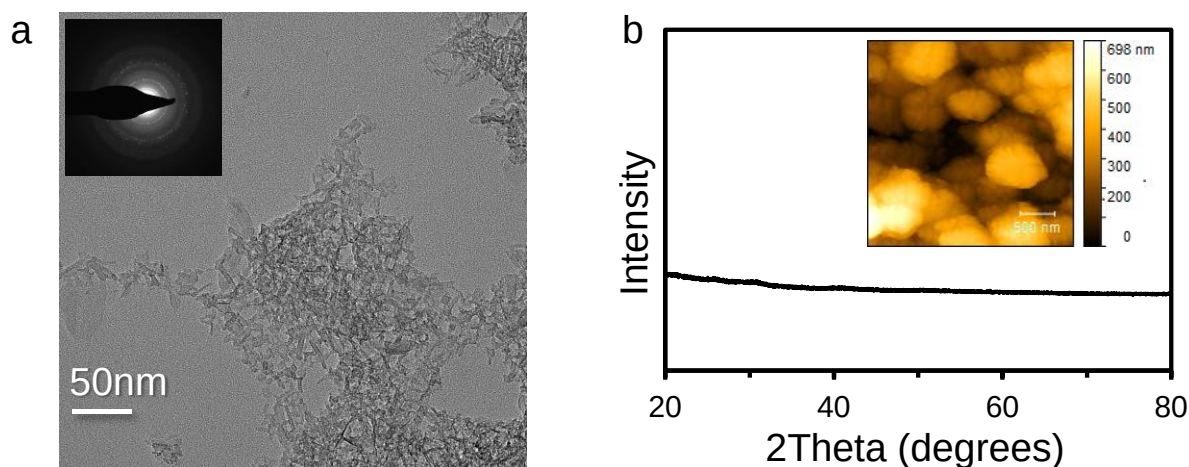


Figure S1. (a) TEM image of the VO_x nanostructures, with the SAED pattern in the inset. (b) XRD and AFM (inset) data of the VO_x thin films after low-temperature thermal annealing and UV-ozone processing.

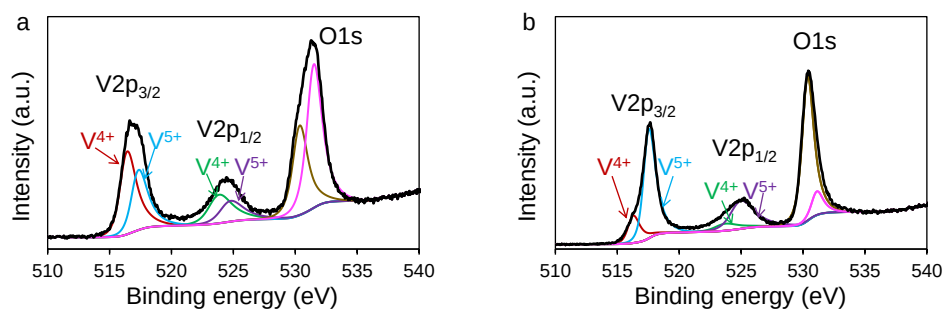


Figure S2. O 1s/V 2p XPS spectra of the VO_x thin film after (a) thermal annealing and (b) UV-ozone processing. After the UV-ozone processing, the V^{5+} to V^{4+} ratio increased from about 3:4 to 4:1.

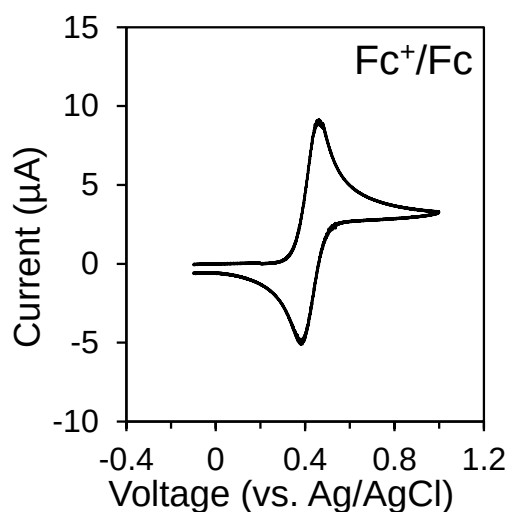


Figure S3. Calibration of the Ag/AgCl reference electrode to ferrocenium/ferrocene redox couple.

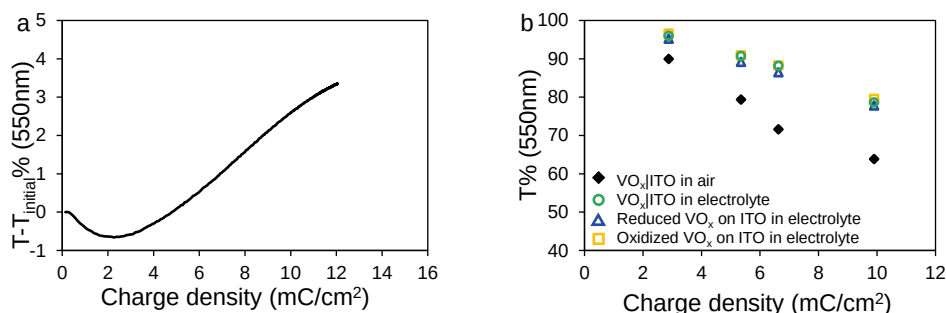


Figure S4. The relation between optical transmittance and charge density of the VO_x thin films. (a) Change in transmittance at 550 nm as a function of increasing charge density for a VO_x thin film with $\sim 80\%$ transmittance. (b) the transmittance values of a series of VO_x thin films at 550 nm, tested in air (black, diamond), in electrolyte (green, sphere), in situ in the reduced state (blue, triangle) and in the oxidized state (yellow, square) as a function of charge density, which is measured by CV in the voltage range of -0.6 V to 0.6 V vs. Ag/AgCl.

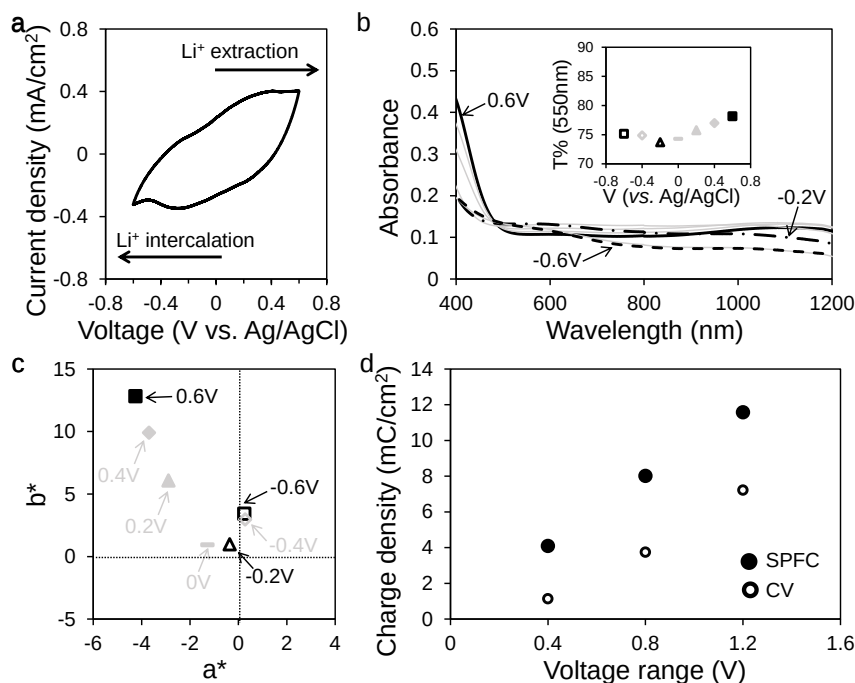


Figure S5. Electrochemical and spectroelectrochemical characterizations of the VO_x thin film after 2, 500 CV cycles, tested in a three-electrode cell with 0.2 M LiTFSI/PC electrolyte. (a) CV data of the VO_x thin film in the voltage range of -0.6 V to 0.6 V vs. Ag/AgCl after cycling. (b) Absorbance of the VO_x thin film at varying voltages after cycling, with transmittance values at 550nm shown in the inset. (c) CIE a^* and b^* coordinate values of the VO_x thin film at varying voltages after cycling (d) charge density as a

function of voltage range, obtained by both CV (hollow) and SPFC (solid) for the VO_x thin film after cycling.

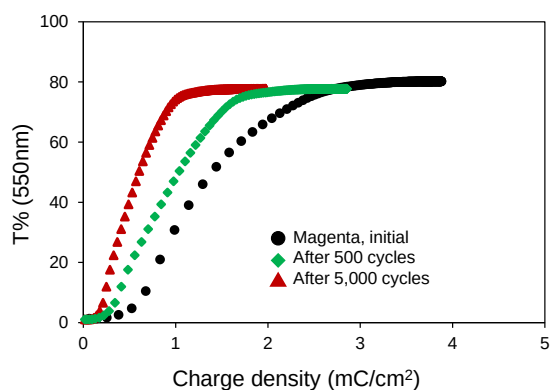


Figure S6. Change in transmittance at 550 nm as a function of charge density for the ECP-Magenta in the initial state (black), after 500 SPFC cycles (green) and after 5,000 SPFC cycles (red).