DETECTION OF SMALL POLARONS IN ELECTROCHEMICAL MODULATED ELECTROCHROMIC TUNGSTEN OXIDE THIN FILMS. **B. Subramanian**[a], M. MacCallum,[a] G. Gibson,[b] R. Irvine,[a] E. Steel,[a] [a] Department of Physics and Astronomy, Trent University, Peterborough, ON, Canada, 1600 W Bank Dr, K9L 0G2 [b] Nanofabrication Kingston, Department of Chemistry, Queens University, Kingston, ON, Canada, Innovation Park, 945 Princess St, K7L 0E9 (balajisubramanian@trentu.ca)

Electrochromic(EC) materials undergo reversible color changes (transparent ⟷ blue) when small cations such as Li^+ are intercalated into their structure by the application of small potentials. In the colored state, they usually block IR radiation and transmit visible radiation, thus finding applications as energy savings materials. Herein, we report on the observed EC functionality in sputter deposited tungsten oxide (WO_3) thin films. To achieve this functionality, the WO_3 films were Lithated by electrochemical method. Optical properties in conjunction with Li ion intercalation/deintercalation of these films were studied by spectroscopic ellipsometry. The obtained optical constants could be fitted well with the small polaron absorption theory proposed by Bryskin [1] to decipher the mechanism of electrochromic coloration. Furthermore, a solid-state ion conducting layer was synthesized and EC-device prototypes were constructed. The detailed Li ion intercalation dynamics of the devices will also be discussed. The films were characterized by SEM and Raman spectroscopy for microstructure and crystalline structure respectively. We observed an optical modulation of about 68% for a wavelength of 750 nm which is suitable for applications in smart windows.

[1] V. V. Bryksin, Fiz. Tverd. Tela (Leningrad) 24, 1110 (1982); [Sov. Phys. Solid State 24, 627 (1982)].