Improved Cycling Stability of Three-state Electrochromic Devices with Uniformly Dip-coated Electrode Surface

L. Wu, D.J. Yang, C.J. Hu, S. Liu, Q.G. Chen, J.Y. Shi, F. Wu, Y. Xiang^{*}

School of Energy Science and Engineering, University of Electronic Science and Technology of China, 2006 Xiyuan Ave, West High-Tech Zone, Chengdu, Sichuan 611731, China.

^{*}E-mail: xyg@uestc.edu.cn

doi: 10.20964/2017.07.14

Received: 20 February 2017 / Accepted: 16 April 2017 / Published: 12 June 2017

The electrodeposition-based three-state electrochromic device with its electrode surface modified by dip-coated titanium dioxide (TiO₂) thin films shows significantly improved cycling stability compared to the device modified with spin-coated ones. The decrement rate of optical transmittance contrast for spin-coated device after 1500 cycles is reduced significantly from 66% to 28% for dip-coated device, indicating ~60% improvement. A comparative study of the structural and morphological features of dip- and spin-coated TiO₂ thin films reveals that the surface uniformity of dip-coated device is much better than that of spin-coated one, leading to an improved overall surface roughness, which is a primary factor of the cycling stability. Although the difference in the surface roughness is marginal for the smooth parts of both the dip- and spin-coated TiO₂ thin films, the improved uniformity of the dip-coated TiO₂ thin film surface is conducive to the quick dissolution of Ag back into electrolyte during the switching between the coloration and bleaching states thanks to the reduced locally residual Ag around or into the rough regions caused by TiO₂ nanoparticles agglomeration.

Keywords: Electrodeposition; Electrochromic; Dip-coating; Uniformity; Cycling stability

[FULL TEXT](#)

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).