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Dynamic behaviors of inorganic all-solid-state electrochromic device: Role of potential

Qirong Liu [a,b,c], Qianqian Chen [b,c], Qianqian Zhang [a,b], Guobo Dong [a,b], Xiaolan Zhong [a,b], Yu Xiao [a,b,c], Marie-Paule Delplancke-Ogletree [b,d], François Reniers [b,c], Xungang Diao [a,b,*]

[a] *School of Physics and Nuclear Energy Engineering, Beihang University, Beijing 100191, China*

[b] *ULB-BUAA Plasma Laboratory for Materials and Environment*

[c] *CHANI, Faculté of Sciences, Université Libre de Bruxelles, Brussels 1050, Belgium*

[d] *4MAT, School of Engineering, Université Libre de Bruxelles, Brussels 1050, Belgium*

Abstract

Applied potential plays a significant role in the properties of electrochromic devices (ECDs), for example, cyclic property, optical modulation, and response rate. In this study, inorganic all-solid-state ECDs with the multilayer structure of Glass/ITO/NiO_x/Ta_2O_5/$LiNbO_3$/Ta_2O_5/WO_3/ITO were prepared by magnetron sputtering. The potential dependence of charges dynamic behaviors in the ECDs were analyzed on the basis of cyclic voltammograms (CVs), chronoamperograms (CAs), multi-potential steps, and *in-situ* optical transmittance at 550 nm. Results demonstrated that the trapping of Li^+ ions in NiO_x layer and in WO_3 layer were responsible for the degradation of electrochromic properties of the ECDs operated at different potential ranges. Besides, the dynamic behavior of Li^+ ions in WO_3 layer, acting as the primary electrochromic layer in the ECDs, had a crucial influence on the response characteristics of the ECDs. Excellent optical memory effects at randomly electrochromic extent were observed and the corresponding open-circuit potential was relevant to the chemical potential of the ECDs.

Keywords: Electrochromic device, Dynamic behaviors, Inorganic, Applied potential, All-solid-state

1 Introduction

* Corresponding author at: School of Physics and Nuclear Energy Engineering, Beihang University, Beijing 100191, China.

E-mail address: *diaoxg@buaa.edu.cn* (Xungang Diao).