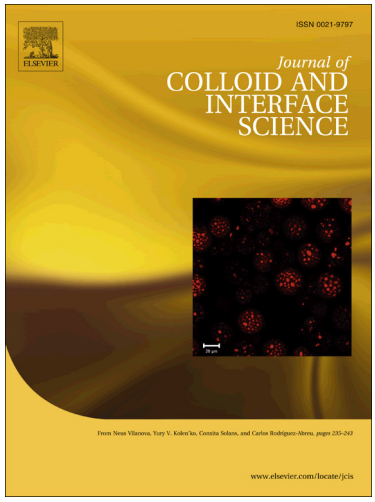

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Tunable resistance switching in solution processed chromium-doped strontium titanate nanoparticles films

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A B S T R A C T

In this work, resistance switching behaviours in solution processed chromium (Cr)-doped strontium titanate ($SrTiO_3$) films have been investigated. Undoped $SrTiO_3$ film shows *I-V* characteristics of typical nonlinear resistor and no resistance hysteresis loops are observed. On the contrary, Cr-doped $SrTiO_3$ films show stable and reversible hysteresis loops, which can be controlled by applying different voltage bias. Based on a series of characterization results, including X-ray diffraction (XRD), Raman and X-ray photoelectron spectroscopy (XPS), we infer that Ti^{4+} is substituted by Cr^{3+}, giving rise to increased concentration of oxygen vacancies. Therefore, the observed resistance switching phenomenon is attributed to voltage driven oxygen vacancy migration. Furthermore, gradually decreased overall resistance is also realized under repeated sweeping cycles.

1. Introduction

$SrTiO_3$ is a multifunctional perovskite oxide that possesses unique physical and chemical properties, such as superconductivity, high dielectric constant, good photocatalytic activity and thermal stability [1-4]. Meanwhile, the properties of $SrTiO_3$ can also be tailored by compositional design, making $SrTiO_3$ as one of the most useful functional materials. Recently, resistance switching behaviour in $SrTiO_3$ has been intensively studied for next-generation non-volatile memory applications [5].

Pure $SrTiO_3$ is an insulator with a large band gap of 3.2 eV. In the presence of active electrode (Ag or Cu), filamentary resistance switching behaviour will occur resulting from the electrochemical

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