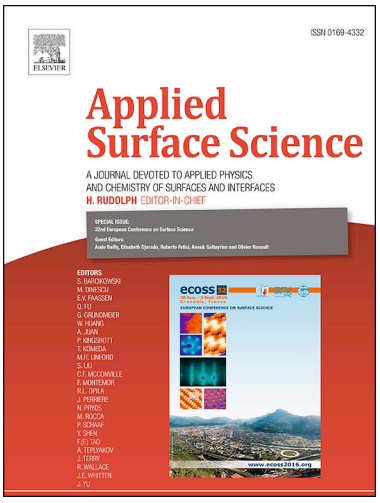

Full Length Article

Substrate-dependent structural and CO sensing properties of $LaCoO_3$ epitaxial films

Haifeng Liu, Hongjuan Sun, Ruishi Xie, Xingquan Zhang, Kui Zheng, Tongjiang Peng, Xiaoyu Wu, Yanping Zhang

PII: S0169-4332(18)30583-X
DOI: https://doi.org/10.1016/j.apsusc.2018.02.221
Reference: APSUSC 38679

To appear in: *Applied Surface Science*

Received Date: 7 November 2017
Revised Date: 13 January 2018
Accepted Date: 22 February 2018

Please cite this article as: H. Liu, H. Sun, R. Xie, X. Zhang, K. Zheng, T. Peng, X. Wu, Y. Zhang, Substrate-dependent structural and CO sensing properties of $LaCoO_3$ epitaxial films, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.02.221

Substrate-dependent structural and CO sensing properties of $LaCoO_3$ epitaxial films

Haifeng Liu [a, *], Hongjuan Sun [b, *], Ruishi Xie [a], Xingquan Zhang [a], Kui Zheng [a], Tongjiang Peng [b], Xiaoyu Wu [c], Yanping Zhang [a]

[a]Analytical and Testing Center, Southwest University of Science and Technology, Mianyang 621010, PR China

[b]Institute of Mineral Materials & Application, Southwest University of Science and Technology, Mianyang 621010, PR China

[c]Academic library, Southwest University of Science and Technology, Mianyang 621010, PR China

Abstract: $LaCoO_3$ thin films were grown on different (001) oriented $LaAlO_3$, $SrTiO_3$ and $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ by the polymer assisted deposition method, respectively. All the $LaCoO_3$ thin films are in epitaxial growth on these substrates, with tetragonal distortion of CoO_6 octahedrons. Due to different in-plane lattice mismatch, the $LaCoO_3$ film on $LaAlO_3$ has the largest tetragonal distortion of CoO_6 octahedrons while the film grown on $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ has the smallest tetragonal distortion. The relative contents of the surface absorbed oxygen species are found to increase for the $LaCoO_3$ epitaxial films grown on (001) oriented $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$, $SrTiO_3$ and $LaAlO_3$ substrates, sequentially. The film sensors exhibit good CO sensing properties at 150 □, and the $LaCoO_3$ film on $LaAlO_3$ shows the highest response but the film on $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ shows the lowest. It reveals that the larger degree of JT-like tetragonal distortion of CoO_6 octahedrons may greatly improve the surface absorbing and catalytic abilities, corresponding to more excellent CO sensing performance. The present study suggests that the formation of epitaxial films is an efficient methodology for controlling the octahedral distortion and thereby improving the gas sensing performance of perovskite transition metal oxides.

Keywords: $LaCoO_3$, Epitaxial films, Tetragonal distortion, CO, Sensors.

*Corresponding author. E-mail address: haifengliu2010@hotmail.com (H.F. Liu), sunhongjuan@swust.edu.cn (H.J. Sun).