

Accepted Manuscript

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PII: S0925-8388(17)33314-5

DOI: [10.1016/j.jallcom.2017.09.264](https://doi.org/10.1016/j.jallcom.2017.09.264)

Reference: JALCOM 43320

To appear in: *Journal of Alloys and Compounds*

Received Date: 15 May 2017

Revised Date: 7 September 2017

Accepted Date: 24 September 2017

Please cite this article as: A. Wei, C. Chen, L. Tang, K. Zhou, D. Zhang, Chemical solution deposition of ferroelectric Sr:HfO₂ film from inorganic salt precursors, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.09.264.

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Chemical solution deposition of ferroelectric Sr:HfO₂ film from inorganic salt precursors

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Abstract

Strontium doped hafnium oxide (Sr:HfO₂) ferroelectric thin films with strontium concentrations ranging from 0 to 20mol% were processed with inorganic hafnium source and strontium source using a chemical solution deposition technique. The co-existence of monoclinic phase and ferroelectric orthorhombic phase in the Sr doped HfO₂ thin film was confirmed by x-ray diffraction and high-resolution transmission electron microscopy results. The atomic force microscope measurements were adopted and the thin films showed crack-free surface. The intrinsic ferroelectricity of the doped HfO₂ thin films could be demonstrated by polarization–voltage hysteresis loops together with piezoelectric force microscope. The maximum twofold remnant polarization value of 3.02 $\mu\text{C}/\text{cm}^2$ with a coercive field of 2.0 MV/cm was achieved when the Sr content was 7.5 mol%. Meanwhile, the polarization didn't show obvious degradation until 10^7 electric cycles, indicating the good fatigue performance of the Sr:HfO₂ film. These findings indicate that it is a feasible way to prepare Sr:HfO₂ ferroelectric thin films via chemical solution deposition with inorganic salt precursors.

Key words: hafnium oxide, thin films, chemical solution deposition, ferroelectricity,

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