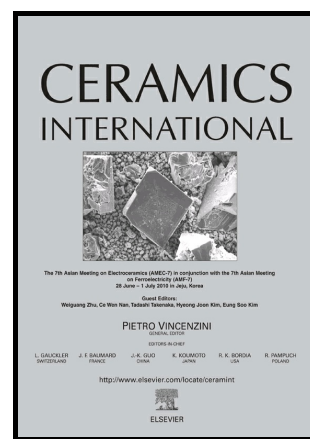


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PII: S0272-8842(17)31750-9
DOI: <http://dx.doi.org/10.1016/j.ceramint.2017.08.055>
Reference: CERI16009

To appear in: *Ceramics International*

Received date: 10 July 2017
Revised date: 6 August 2017
Accepted date: 7 August 2017

Cite this article as: Xin Dong, Guodong Xia, Qian Zhang, Lubin Li, Hongyu Gong, Jianqiang Bi and Sumei Wang, Room-Temperature UV-Ozone Assisted Solution Process for Zirconium Oxide Films with High Dielectric Properties *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2017.08.055>

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Room-Temperature UV-Ozone Assisted Solution Process for Zirconium Oxide Films with High Dielectric Properties

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Abstract

A facile, low-cost, and room-temperature UV-ozone (UVO) assisted solution process was employed to prepare zirconium oxide (ZrO_x) films with high dielectric properties. ZrO_x films were deposited by a simple spin-coating of zirconium acetylacetonate (ZrAcAc) precursor in the environment-friendly solvent of ethanol. The smooth and amorphous ZrO_x films by UVO exhibit average visible transmittances over 90% and energy bandgap of 5.7 eV. Low leakage current of $6.0 \times 10^{-8} \text{ A/cm}^2$ at 3MV/cm and high dielectric constant of 13 (100 Hz) were achieved for ZrO_x dielectrics at the nearly room temperature. Moreover, a fully room-temperature solution-processed oxide thin films transistor (TFT) with UVO assisted ZrO_x dielectric films achieved acceptable performances, such as a low operating voltage of 3 V, high carrier mobility of $1.65 \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$, and on/off current ratio about $10^4 \sim 10^5$. Our work indicates that simple room-temperature UVO is highly potential for low-temperature, solution-processed and high-performance oxide films and devices.

Keywords: High-k dielectrics; Metal oxides; Sol-gel; Thin-film transistor; Low-temperature;

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