

Accepted Manuscript

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PII: S0955-2219(17)30500-9
DOI: <http://dx.doi.org/doi:10.1016/j.jeurceramsoc.2017.07.013>
Reference: JECS 11370

To appear in: *Journal of the European Ceramic Society*

Received date: 16-3-2017
Revised date: 9-7-2017
Accepted date: 17-7-2017

Please cite this article as: Gayathri Thozhuthungal Haridasan, Yaremchenko Aleksey A, Zakharchuk Kiryl, Abhilash Pullanchiyodan, Ananthakumar Solaiappan. Impact of acceptor-type substitution on electrical transport properties of zircon-type EuVO_4 . *Journal of The European Ceramic Society* <http://dx.doi.org/10.1016/j.jeurceramsoc.2017.07.013>

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IMPACT OF ACCEPTOR-TYPE SUBSTITUTION ON ELECTRICAL TRANSPORT PROPERTIES OF ZIRCON-TYPE EuVO_4

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Abstract

Magnesium-substituted europium vanadate ceramics, $\text{Mg}_x\text{EuVO}_{4\pm\delta}$ ($x = 0-0.5$), were prepared by solid state method and characterized by XRD, SEM/EDS, dilatometry, UV-visible spectroscopy, impedance spectroscopy, and measurements of oxygen-ion transference numbers (\bar{t}_0). Magnesium was found to substitute preferentially into vanadium sublattice of zircon-type EuVO_4 with limited solubility of ~ 5 at.%. Additions of magnesium increase slightly coefficients of thermal expansion (3.2-6.0 ppm/K at 150-400°C) and have negligible effect on the optical properties. Undoped EuVO_4 is predominantly an oxygen-ionic conductor with $\bar{t}_0 = 0.96-0.99$ at 700-900°C under oxidizing conditions. Acceptor-type substitution suppresses total conductivity and oxygen-ionic transport. The variations of electrical transport properties are discussed in terms of interstitial oxygen diffusion in the parent EuVO_4 and oxygen vacancy diffusion in Mg-substituted vanadate. Humidified atmosphere has negligible impact on the electrical properties of substituted ceramics but results in

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