

International Conference and Expo on Ceramics

August 17-18, 2015 Chicago, USA

New comprehensive defect-crystal-chemistry approach to defect-fluorite oxides-(m_1 - Ln_{y}) $\text{O}_{2-\text{y}/2}$ ($\text{M}^{4+}=\text{Zr, Hf, Ce and Th etc}$, $\text{Ln}^{3+}=\text{lanthanide}$)

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This presentation describes the recently proposed a new comprehensive defect-crystal-chemistry approach as a possible unified generalized Vegard-Law (VL) description of non-Vegardianity and non-random defect structure of entitled so-called defect-fluorite oxides as inherently coupled two sides of distortion-dilation in macroscopic lattice parameter and microscopic ionic radius level, respectively. It provides a new direct link to their controversial defect structure and its dependent key basic as well as engineering properties such as oxide-ion conductivity ($\sigma(\text{ion})$) and defect thermodynamic behavior, etc. This presentation is a condensed review of the technology; and scientifically emphasized description of the value of Mössbauer, NMR and EXAFS, etc., microscopic and spectroscopic local structure data in combination with macroscopic XRD lattice parameter/crystal structure data in both formulating and substantiating the model, and in practical engineering aspect, in view of their well-known application as solid electrolytes in SOFC (solid oxide fuel cell) technology. I appeal its near quantitative ability to predict and describe their key characteristic feature of ionic conductivity maximum ($\sigma(\text{ion})(\text{max})$) behavior in low dopant (Ln^{3+}) content range.

Biography

Akio Nakamura is a PhD from University of Tokyo (1975). He is a Senior Researcher at ASRC/ JAEA, studying solid state electrochemistry of fluorite oxides. He is the author of ~200 peer-reviewed papers, guest editor/organizing committee member of many international conferences. He is the book Editor for books like "New research trends of fluorite-based oxide materials; from basic chemistry and materials science to engineering applications" from Nova Science Publishers (NY) published in 2015, and a recipient of Jubilee Gold Medal Award for Excellent Work in Materials Chemistry at the ICFM-2015 convened by Indian Association of Solid State Chemists and Allied Scientists at Nagpur, India, 2015.

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