5th International Conference and Expo on

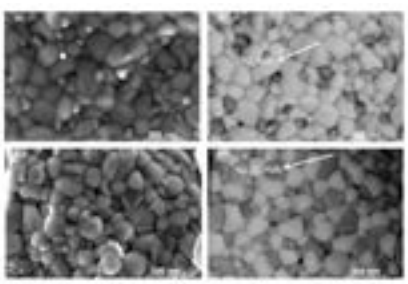
Ceramics and Composite Materials

June 03-04, 2019 | London, UK

Influence of galia (Ga_2O_3) addition on the phase evolution and grain growth behavior of voided yttria stabilized zirconia (YSZ) powder

Chen Barad
Ben-Gurion University, Israel

The effect of galia addition to diverse metal oxides has been occupying researchers in the aspects of preparation finer powders and improving sintering of advanced ceramic materials for high temperature applications. Pure galia shows polymorphism, but at high temperatures only its monoclinic form is thermodynamically stable. Moreover, by adjusting the ambient atmosphere, oxygen vacancies are formed in the non-stoichiometric gallium oxide structure which is advantageous in oxygen ion conducting applications. However, in spite of being the most popular solid oxygen conducting electrolyte, the addition of galia to YSZ has not been researched profoundly. The effect of a galia (Ga_2O_3) addition on the crystallographic phase transformations and the grain growth behavior of yttria stabilized zirconia (YSZ) were investigated regarding powders containing different amounts of galia in the range of 0-25 mol %. Ternary compositions of galia- YSZ sponge-like cryogels were prepared by the sol-gel method combining freeze-drying process and calcination of dried powders at different temperatures for two hours in air. Crystallographic phase transitions were analyzed via X-ray diffraction (XRD) and exceptional powder particle morphology of internal nano voids derived from the freeze-drying technique was investigated by using Scanning Transmission Electron Microscope (STEM). The effect of Ga_2O_3 addition to 8YSZ was found to be similar to that of Ga_2O_3 addition to zirconia sol-gel powders. The addition of Ga_2O_3 to 8YSZ inhibited the crystallization of 8YSZ extending the amorphous range and increasing activation energy for the growth process of grains. Regarding sol-gel powder morphology, it was found that by coupling the sol-gel synthesis with the freeze-drying technique it is achievable to preserve unique nano-voids in the ternary it is achievable to preserve unique nano-voids in the ternary system of 8YSZ+Ga_2O_3.



Recent Publicatiotns

1. C. Barad, G. Kimmel, H. Hayun, D. Shamir, M. Shandalov, G. Shekel and Y. Gelbstein, (2018). Journal of materials science, 53, 12741.
2. C. Barad, G. Shekel, M. Shandalov, H. Hayun, G. Kimmel, D. Shamir and Y. Gelbstein, (2017). Materials, 10, 1440.
3. G. Shekel, C. Barad, H. Hayun, Y. Sadia, Y. Gelbstein, Y, (2018). Physical Chemistry Chemical Physics, 20, 16666.

4. K. Kaneko, H. Ito, S. Lee and S. Fujita, (2013). Physica Status Solidi (c), 10, 1596.
5. L. Ghadbeigi, Z. Liu, T.D. Sparks and A.V. Virkar, (2016). Journal of The Electrochemical Society, 163, A1560.

Biography

Chen Barad is pursuing her Graduation and has expertise in sol-gel synthesis and in the field of ceramic materials. Her previous knowledge and experience in chemistry and chemical engineering creates new pathways for research in the field of ceramic materials. She has experience in research of YSZ powders and other zirconia based powders for energy applications (solid oxide fuel cells and thermal barrier coatings), designing powder particle morphology and analyzing XRD patterns.

chenhu@post.bgu.ac.il

Notes: