J Fundam Renewable Energy Appl 2018, Volume 8
DOI: 10.4172/2090-4541-C5-063

Strongly enhanced ionic conductivity in hetero-structured doped-CeO2/SrTiO3 for solid oxide fuel cells

Chen Xia[1] and **Bin Zhu**[2]
[1]KTH Royal Institute of Technology, Sweden.
[2]Hubei University, Wuhan, China

Since colossal ionic conductivities in 2D planar heterostructures were demonstrated, such as Y_2O_3-stabilized $ZrO_2/SrTiO_3$ heterostructure [1,2], tremendous efforts have been contributed to this topic even though there has been much debate surrounding it. In this work, we developed a new type of 3D hetero-structured composite material doped-$CeO_2/SrTiO_3$ to replace the conventional YSZ electrolyte layer in solid oxide fuel cells (SOFCs). As a consequence, the cells showed stable low-temperature operation and appreciable power outputs, achieving a peak power density of 0.9 W/cm^2 at 550°C achieved by Sm-doped $CeO_2/SrTiO_3$ (SDC/STO) fuel cell and above 0.8 W/cm^2 at the same temperature by Gd-doped $CeO_2/SrTiO_3$ (GDC/STO) fuel cell. Through investigation on the two materials from micro-structure and electrochemical perspectives, the extraordinary cell performances was found to be primarily attributed to the strongly improved ionic conduction at the heterophasic interface of the composites. This is the first study to realize greatly enhanced ionic conductivity in such hetero-structured system, it brought about some new understandings on hetero-structured materials for SOFC applications.

cxia@kth.se