Contribution ID: **12** Type: **Poster**

# The Search for an Improved SOFC Electrolyte Material: Stabilizing the Fm$\bar{3}$m Phase of Bismuth Oxide to Lower Temperatures

*Monday, 11 November 2019 17:00 (1 hour)*

SOFCs have emerged as a leading candidate in the search for an efficient and environmentally friendly source of electrical energy.[1-7] SOFCs are, however, marred by a variety of limitations[1,4,6] which have prevented the widespread commercialization of this technology. Most of these limitations stem from the high operating temperature (typically 800-1000 ℃) that is associated with these cells – a feature dictated by the electrolyte material. As such, there exists a need for an improved electrolyte; a material that will display high oxide ion conduction at substantially lower temperatures. One such candidate is the Fm¯3m-structured δ-polymorph of Bi2O3 – the highest known oxide ion conductor. Normally only stable within a high and narrow temperature range (730-824 ℃),[1] this cubic polymorph has been exclusively studied in this work with the primary aim of stabilizing the δ-polymorph structure to lower temperatures by means of yttrium doping. These attempts have been successful; various YxBi2-xO3 members have been found to display the Fm¯3m structure at room temperature. Detailed structural analyses, enabled by synchrotron-based experiments, coupled with ionic conductivity and thermal expansion studies enable the establishment of preliminary material-specific structure-property relationships that allow for the overall suitability of these materials as SOFC electrolytes to be assessed.

REFERENCES:
1. Stambouli, A. B.; Traversa, E. Renew. Sustain. Energy Rev. 2002, 6, 433–455.
2. Ruiz-Morales, J. C.; Marrero-Lopez, D.; Galvez-Sanchez, M.; Canales-Vazquez, J.; Savaniu, C.; Savvin, S. N. Energy Environ. Sci. 2010, 3, 1670-1681.
3. Fergus, J. W. J. Power Sources. 2006, 162, 30–40.
4. Zuo, C.; Liu, M.; Liu, M. In Sol-Gel Processing for Conventional and Alternative Energy, eds. M. Aparicio et al. Springer Science+Business Media, New York, 2012; Chap. 2, pp 7-36.
5. Gomez, S. Y.; Hotza, D. Renew. Sustain. Energy Rev. 2016, 61, 155–174.
6. Fellet, M.; Rossner, W. MRS bulletin. 2015, 40, 214–215.
7. Minh, N. Q. Solid State Ion. 2004, 174, 271–277.

**Primary author:** Mr KIEFER, Mathias (Wits University)

**Co-authors:** Dr BILLING, Caren (Wits University); Prof. BILLING, David (University of the Witwatersrand)

**Presenter:** Mr KIEFER, Mathias (Wits University)

**Session Classification:** Poster Session 1

**Track Classification:** Materials