Tae-Sik Oh

Assistant Professor
Chemical Engineering, Auburn University

Office: 334-844-2088, Mobile: 626-628-4416
Email: taesik.oh@auburn.edu, taesik.oh@gmail.com

Professional Preparation

Ph.D. California Institute of Technology 2008 Jul – 2012 Sep
Materials Science, Advisor: Prof. Sossina M. Haile

M.S. California Institute of Technology 2006 Sep – 2008 Jun
Materials Science, Advisor: Prof. Sossina M. Haile

M.S. Seoul National University, South Korea 2004 Sep – 2006 Aug
Materials Science and Engineering, Advisor: Prof. Han-Ill Yoo

B.S. with honors (Cum laude)**, Seoul National University, South Korea** 1998 Mar – 2004 Aug
Materials Science and Engineering,
26 months of mandatory army service during this period.

Research Activities

Auburn University 2016 Jun – Present

- Developing membrane reactors for gas conversion
- Designing organic-inorganic composite membranes for water treatment
- Screening nitride materials for ammonia production by solar-thermal hydrolysis
- Controlling oxide thermal conductivity by internal precipitation

University of Pennsylvania 2012 Oct – 2016 May
Advisor: Prof. Raymond J. Gorte, Prof. John M. Vohs

- Investigated metal exsolution behavior from perovskite oxides in energy/catalysis application with coking resistant, coarsening resistant nickel nanoparticles (collaboration with Prof. Irvine, University of Saint Andrews).
- Proposed a model that describes metal exsolution process that agrees well with atomic force microscopy 3d morphology reconstruction (collaboration with Prof. Shenoy, University of Pennsylvania).
- Evaluated hydrogen fuel cell performance with infiltrated perovskite oxide electrodes and direct carbon fuel cell with molten metal electrodes.
- Filed a U. S. provisional patent “Direct Carbon Fuel Cells and Stack Designs” with Prof. Gorte.
- Characterized oxygen permeation membranes for syngas production.

Solid State Ionics & Electroceramics Group, California Institute of Technology 2006 Sep – 2012 Sep
Advisor: Prof. Sossina M. Haile

- Designed and constructed an in-house chemical vapor deposition chamber (collaboration with Prof. Goodwin, Caltech).

- Conducted cerium oxide deposition on fuel cell related substrates as well as single crystalline wafers.
- Investigated cerium oxide thin film proton conductivity using AC impedance spectroscopy.
- Studied fuel cell electrochemical reaction kinetics with point-contact geometry for chemical vapor deposition grown doped ceria thin film electrodes.
- Studied microstructure-reaction kinetics relationship by controlled deposition condition for thin film electrodes with embedded symmetric patterned metal current collectors.
- Co-developed optical transmittance fitting code to extract thin film refractive index and microstructural parameters.

Solid State Ionics Research Lab, Seoul National University 2004 Sep – 2006 Aug
Advisor: Prof. Han-Ill Yoo

- Measured oxygen vacancy mobility by color front migration on single crystal barium titanate.
- Conducted UV-VIS spectroscopy study on single crystal barium titanate to illuminate the nature of the coloration under DC bias (collaboration with Prof. K.D. Becker, Technische Universitat Braunschweig).
- Investigated quenched state defect chemistry of barium titanate by DC 4 point conductivity measurement
- Measured thermovoltage of $Ge_2Sb_2Te_5$ thin films (collaboration with Samsung electro-mechanics).

Publications

Yicheng Zhao, **Tae-Sik Oh***, Yongdan Li, John M. Vohs, and Raymond J. Gorte, "Fabrication of $MnCo_2O_4$-YSZ composite cathodes for solid oxide fuel cells by electrodeposition," **Corresponding author**, *Journal of the Electrochemical Society*, 2016, 163, F863.

Tzia Ming Onn, Lisandra Arroyo-Ramírez, Matteo Monai, **Tae-Sik Oh**, Meghavi Talati, Paolo Fornasiero, Raymond Gorte, Mahmoud Mohamad Khader, "Modification of Pd/CeO_2 catalyst by ALD of ZrO_2," *Applied Catalysis B: Environmental*, 2016, 197, 280.

Yuan Cheng, Anthony S. Yu, Xiaoyan Li, **Tae-Sik Oh**, John M. Vohs, and Raymond J. Gorte, "Preparation of SOFC cathodes by infiltration into LSF-YSZ composite scaffolds," *Journal of the Electrochemical Society*, 2016, 163, F54.

Tae-Sik Oh, Ehsan K. Rahani, Dragos Neagu, John T. S. Irvine, Vivek B. Shenoy, Raymond J. Gorte, and John M. Vohs, "Evidence and model for strain-driven release of metal nano-catalysts from perovskites during exsolution," *Journal of Physical Chemistry Letters*, 2015, 6, 5106.

Dragos Neagu*, **Tae-Sik Oh***, David N. Miller, Hervé Ménard, Syed M. Bukhari, Stephen R. Gamble, Raymond J. Gorte, John M. Vohs, and John T.S. Irvine, "Nano-socketed nickel particles with remarkable coking resistance grown in situ by redox exsolution," **Equal contribution authors,** *Nature Communications*, 2015, 6:8120 DOI: 10.1038/ncomms9120.

Tae-Sik Oh and Sossina Haile, "Electrochemical behavior of thin-film Sm-doped ceria: Insight from the point-contact configuration," *Physical Chemistry Chemical Physics*, 2015, 17, 13501.

Anthony S. Yu, **Tae-Sik Oh**, Ran Zhu, Alexa M. Gallegos, Raymond J. Gorte, and John M. Vohs, "Surface modifications of $La_{0.8}Sr_{0.2}CrO_{3-\delta}$-YSZ dual-phase membranes for syngas production," *Faraday Discussions*, 2015, 182, 213.

Xiaoliang Zhou, **Tae-Sik Oh***, John M. Vohs, and Raymond J. Gorte, "Zirconia-based electrolyte stability in direct-carbon fuel cells with molten Sb anodes," **Corresponding author**, *Journal of the Electrochemical Society*, 2015, 162, F567.

Jiaxin Zhu, Carlos R. Pérez, **Tae-Sik Oh**, Rainer Küngas, John M. Vohs, Dawn A. Bonnell, and Stephen S. Nonnenmann, "Probing local electrochemical activity within yttria-stabilized-zirconia via in situ high-temperature atomic force microscopy," *Journal of Materials Research*, 2015, 30, 357.

Anthony S. Yu, Junyoung Kim, **Tae-Sik Oh**, Guntae Kim, Raymond J. Gorte, and John M. Vohs, "Decreasing interfacial losses with catalysts in $La_{0.9}Ca_{0.1}FeO_{3-\delta}$ membranes for syngas production," *Applied Catalysis A: General*, 2014, 486, 259.

Tae-Sik Oh, Anthony S. Yu, Lawrence Adijanto, Raymond J. Gorte, and John M. Vohs, "Infiltrated lanthanum strontium chromite anodes for solid oxide fuel cells: structural and catalytic aspects," *Journal of Power Sources*, 2014, 262, 207.

Krithiga Ganesan, Leonid A. Dombrovsky, **Tae-Sik Oh**, and Wojciech Lipinski, "Determination of optical constants of ceria by combined analytical and experimental approaches," *JOM*, 2013, 65, 1694.

Tae-Sik Oh, David Boyd, David Goodwin, and Sossina Haile, "Proton conductivity of columnar ceria films grown by chemical vapor deposition," *Physical Chemistry Chemical Physics*, 2013, 15, 2466.

Tae-Sik Oh, Yury S. Tokpanov, Yong Hao, WooChul Jung, and Sossina M. Haile, "Determination of optical and microstructural parameters of ceria films," *Journal of Applied Physics*, 2012, 112, 103535.

Han-Ill Yoo, **Tae-Sik Oh**, Hyung-Soon Kwon, Dong-Kyu Shin, and Jong-Sook Lee, "Electrical conductivity-defect structure correlation of variable-valence and fixed-valence acceptor doped $BaTiO_3$ in quenched state," *Physical Chemistry Chemical Physics*, 2009, 11, 3115.

M. Schrader, D. Mienert, **Tae-Sik Oh**, Han-Ill Yoo, and K. D. Becker, "An optical, EPR and electrical conductivity study of blue barium titanate," *Soild State Sciences*, 2008, 10, 768.

H.-I. Yoo, M.-W. Chang, **T.-S. Oh**, C.-E. Lee, and K. D. Becker, "Electrocoloration and oxygen vacancy mobility of $BaTiO_3$," *Journal of Applied Physics*, 2007, 102, 093701.

Patents

Raymond Gorte and **Tae-Sik Oh**, "Direct Carbon Fuel Cells and Stack Designs." 2013, United States Provisional Patent Application No. 61/815,302