Sihyuk Choi

Assistant Professor
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Appointment

Kumoh National Institute of Technology – Gumi, Republic of Korea
Assistant Professor in Mechanical Engineering Sep. 2018 – Present

Education

Ulsan National Institute of Science and Technology(UNIST) – Ulsan, Republic of Korea
Ph. D. in Energy Engineering Jan. 2015

University of Ulsan – Ulsan, Republic of Korea
B.S. in Mechanical Engineering Feb. 2010

Research Experiences

Northwestern University – Evanston, IL, USA Aug. 2015 – Jul. 2018
California Institute of Technology – Pasadena, CA, USA Jan. 2015 – Jul. 2015
Postdoctoral Associate (Advisor: Prof. Sossina M. Haile)

- Participated in ARPA-e project to develop electrode/electrolyte materials for protonic ceramic fuel cell.
- Development of protonic ceramic fuel/electrolysis cell fabrication via ceramic processing
- Understanding reaction pathway mechanism by high-throughput microprobe impedance technique.
- Hydrogen production by water splitting through the protonic ceramic electrolysis cell.

UNIST – Ulsan, Republic of Korea 2010 Mar – 2015 Jan
Graduate Research Assistant (Advisor: Prof. Guntae Kim)

- Nano-sized ceramic oxide powder synthesis with via Solid state reaction Pechini method, Modified Pechini method, Glycine Nitrate process (GNP), and Sol-gel method.
- Ceramic processing development for solid oxide fuel cell fabrication with various thin film electrolyte.
- Understanding and development of layered perovskite structure.
- Various hydrocarbon fuels utilization.
- Characterizations of thermodynamic properties by coulometric titration.

Selected Publications

1. **Sihyuk Choi** *et al.*, ***Energy & Environmental Science*** (2019)
   Protonic ceramic electrochemical cells for hydrogen production and electricity generation: exceptional reversibility, stability, and demonstrated faradaic efficiency
   "2018 Energy and Environmental Science HOT Article"

2. **Sihyuk Choi** *et al.*, ***Nature Energy*** (2018)
   Exceptional power density and stability at intermediate temperatures in protonic ceramic fuel cells

3. **Sihyuk Choi** *et al.*, ***Journal of Materials Chemistry A*** (2016)
   A robust symmetrical electrode with layered perovskite structure for direct hydrocarbon solid oxide fuel cells: $PrBa_{0.8}Ca_{0.2}Mn_2O_{5+\delta}$

4. **Sihyuk Choi** *et al.*, ***Journal of Materials Chemistry A*** (2015)
   The effect of calcium doping on improvement of performance and durability in a layered perovskite cathode for intermediate-temperature solid oxide fuel cells"

5. Sivaprakash Sengodan‡, **Sihyuk Choi‡ (Equal contributor)** *et al.*, ***Nature Materials*** (2015)
   Layered oxygen-deficient double perovskite as efficient and stable anode for direct hydrocarbon solid oxide fuel cells

6. Yuri Choi‡, **Sihyuk Choi‡ (Equal contributor)** *et al.*, ***ACS Applied Materials & Interfaces*** (2014)
   Highly Efficient Layer-by-Layer-Assisted Infiltration for High-Performance and Cost-Effective Fabrication of Nanoelectrodes

7. **Sihyuk Choi** *et al.*, ***Electrochemistry Communications*** (2013)
   Electrochemical properties of an ordered perovskite $LaBaCo_2O_{5+}$-$Ce_{0.9}Gd_{0.1}O_{2-\delta}$ composite cathode with strontium doping for intermediate-temperature solid oxide fuel cells

8. **Sihyuk Choi** *et al.*, ***Scientific Reports*** (2013)
   Highly efficient and robust cathode materials for low-temperature solid oxide fuel cells: $PrBa_{0.5}Sr_{0.5}Co_{2-x}Fe_xO_{5+\delta}$

9. **Sihyuk Choi** *et al.*, ***Journal of Power Sources*** (2012)
   The electrochemical and thermodynamic characterization of $PrBaCo_{2-x}Fe_xO_{5+d}$ (x = 0, 0.5, 1) infiltrated into yttria-stabilized zircornia scaffold as cathodes for solid oxide fuel cells

10. **Sihyuk Choi** *et al.*, ***Journal of the Electrochemical Society*** (2011)
    High Performance SOFC Cathode Prepared by Infiltration of $La_{n+1}Ni_nO_{3n+1}$ (n = 1, 2, and 3) in Porous YSZ