

Korea-EU Horizon Europe Researchers Networking Forum on Energy & Advanced Mobility

Dong Woo Joh

- **Position: Principal Research Engineer**
- **Organization: KIER – Fuel Cell Lab.**
- **Research Area: SOFC/SOEC, NH₃ fuel, stack durability, diagnostics, scale-up**



Introduction of KIER



- The Korea Institute of Energy Research (KIER) founded in 1977 is committed to developing **clean and efficient energy technologies** and contributing to national economic growth.

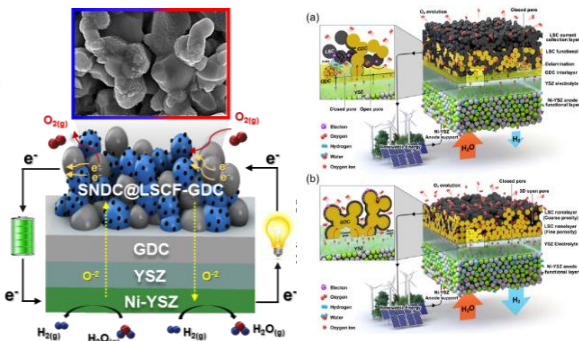
Introduction of Hydrogen Fuel Cell Laboratory

- The Fuel Cell Lab conducts fundamental research, development, and demonstration (RD&D) on solid oxide cells. It focuses on industrialization-oriented technologies spanning solid-oxide materials, cells, stacks, and full systems.

Solid Oxide Cells R&D of KIER

R&D status on Solid Oxide Cells (SOCs)

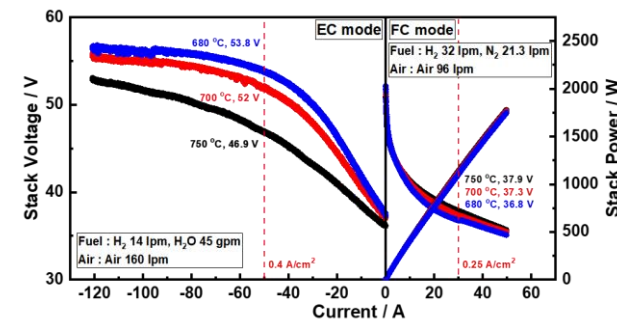
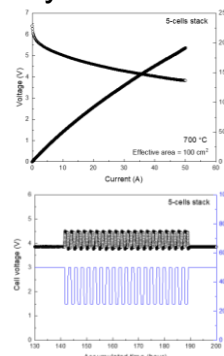
- **Development of a large scale SOC cells : materials, appropriate microstructures and manufacturing processes**
 - Anode support cell performance (300 μm thickness) : $\sim 420 \text{ mW/cm}^2$ @ 0.5 A/cm^2 (effective area $>100\text{cm}^2$)
 - Fuel-flexible cell architecture enabling direct or cracked-ammonia operation via optimized Ni-YSZ microstructures, catalytic layers, and nitridation-tolerant interfaces.
- **SOFC/SOEC stack technology for scalable**
 - Development of a new design stack for high performance and durability
 - Multi-fuel validation ($\text{H}_2/\text{NH}_3/\text{MeOH}/\text{CH}_4$) with standardized $\text{H}_2 \leftrightarrow \text{NH}_3$ fuel-switching protocols
 - 40cell short stack performance : 1.1 kW (FC @ 700°C , 30A, 0.9V/cell) / 2.6 kW (EC @ 700°C , 50A, 1.3V/cell)
- **Bi-directional solid oxide cell (Bi-SOC) : cells and stack technology**
 - Planar solid oxide cell-based stack technology ($>90\%$ SOEC stack efficiency based on LHV)



<SOFC/EC electrode material/process technology>



<Large-area planar cell/stack technology>



<SOFC/EC Stack Performance>





Maritime SOFC: Test & Diagnostics

Targeted Call

HORIZON-CL5-2026-10-D5-11 — *Scalability of SOFC for waterborne transport* (RIA; start TRL 3 → end TRL 5)

Concept

Marine-ready, modular **>50 kW SOFC** module designed for **multi-fuel operation**. (H₂, NH₃, MeOH, CH₄)

Idea briefly explained

- Improve **performance, reliability, durability** of large SOFC stacks/modules
- Validate **fuel flexibility** (H₂ and derivatives)
- Establish **maritime test protocols and diagnostics**
- Develop **innovative sensing & control** for on-board monitoring and predictive maintenance



Consortium Fit & What We Bring

Why we fit the targeted call (HORIZON-CL5-2026-10-D5-11)

- Proven work on **large-area SOC cells** (materials–microstructures–manufacturing) and **stack design** for performance & durability
- **NH₃/H₂ multi-fuel** know-how (fuel flexibility, nitridation mitigation, off-gas/NO_x handling) suited to maritime use cases
- **On-board diagnostics & control** (EIS/ASR estimation, sensor packs) supporting reliability, availability, warm-start KPIs

What we bring

- Testbeds for **stack/short-stack**, marine-profile emulation
- Methods & datasets for **degradation modeling** ($\Delta V/kh$, availability)

Status & interest

- Open to **join an existing team** or **co-form a new consortium** under this topic



Contact Details



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