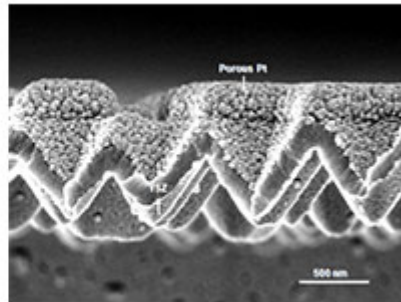
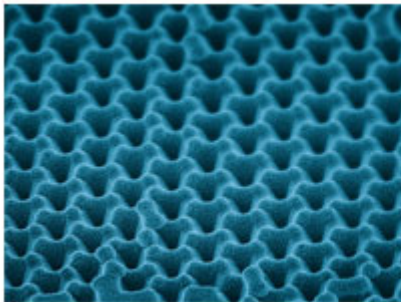


Docket #: S09-219

Nano-patterning of Solid Oxide Fuel Cell Electrolytes

A team of Stanford engineers have developed a low-cost, easy to fabricate membrane electrode assembly (MEA) that is nano-patterned to increase electrode reaction surface area in solid oxide fuel cells (SOFCs). These electrolytes are created with nano-sphere lithography techniques that eliminate the need for photo-lithography intensive steps. The resulting MEA has a thin electrolyte layer shaped into 3-D close-packed hexagonal pyramid arrays. This architecture reduces ohmic loss for better performance at operating temperature between 400-500°C.



The nanostructured YSZ electrolyte layer (~170nm) is coated with porous Pt for a total area enhancement factor of 1.5-2x.

Applications

- **Solid oxide fuel cells**

Advantages

- **Streamlined fabrication** - nano-sphere lithography process, so there is no need to use photo-lithography intensive steps
- **Improved performance** - nanostructure architecture reduces ohmic loss

- **Lower operating temperature** than traditional SOFC (power density of $0.36\text{W}/\text{cm}^2$ at 400°C and $1.34\text{ W}/\text{cm}^2$ at 500°C)

Publications

- Cheng-Chieh Chao, Ching-Mei Hsu, Yi Cui, and Fritz B. Prinz, "[Improved Solid Oxide Fuel Cell Performance with Nanostructured Electrolytes](#)" *ACS Nano* 2011 5 (7), 5692-5696

Patents

- Published Application: [20110076589](#)

Innovators

- Cheng-Chieh Chao
- Ching-Mei Hsu
- Young Beom Kim
- Friedrich Prinz
- Yi Cui

Licensing Contact

Jon Gortat

Licensing & Strategic Alliances Director for Physical Science

[Email](#)