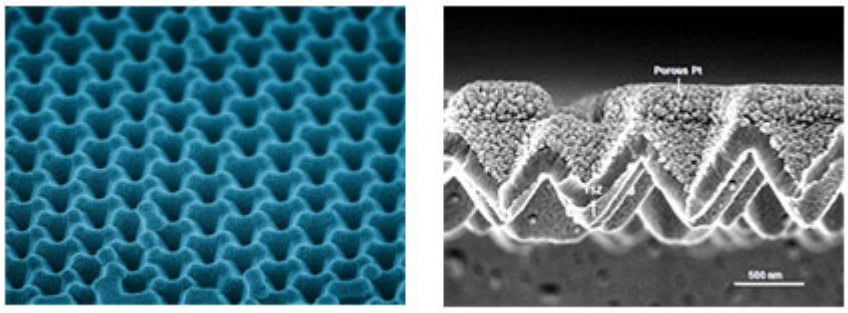
Docket #: S09-219

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^{o}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 0.36W/cm^2 at 400^{o}C and 1.34 W/cm^2 at 500^{o}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

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