Docket #: S19-438

Enhancement of Platinum Electrochemical Activity Through Sublayer Transition Metal Rich Catalyst

Polymer electrolyte membrane (PEM) fuel cells often underperform due to high overpotentials caused by sluggish kinetics. Specifically, the Pt-catalyzed oxygen reduction reaction at the cathode renders the energy efficiency well below the thermodynamic limit. Stanford researchers have developed a metal/ceramic composite electrochemical catalyst that utilizes a sublayer transition metal rich catalyst structure to optimize performance. Traditional nanoparticle catalysts suffer from surface defects (edges and corners) and aggregation, which degrade the catalysts' performance. This invention utilizes a sublayer thin film catalyst later, which is free of aggregation and distinct surface defects. The low loading required for thin films results in higher mass activity with greater surface area exposure. Comparing this composite to traditional syntheses, this composite displays a 5-fold increase in activity for the oxygen reduction reaction, making it potentially useful in PEM fuel cells.

Related Technology: S17-046 Metal/ceramic matrix composite catalyst for fuel cells

Stage of Research

- Proof of concept

Applications

- **Fuel cells**

Advantages

- **Better catalytic activity over existing synthetic methods: 5x higher Pt-based catalytic activity for oxygen reduction reaction**

Patents

- Published Application: WO2021119511
- Published Application: 20230009452
- Issued: 11,973,233 (USA)

Innovators

- Friedrich Prinz
- Zhaoxuan Wang
- Shicheng Xu
- Yongmin Kim
- Thomas Jaramillo
- Drew Higgins
- Maha Yusuf
- Kyung Min Lee
- Marat Orazov
- Dong Un Lee
- Tanja Graf
- Thomas Schladt
- Gerold Huebner
- Hanna-Lena Wittern
- Jonathan Mueller

Licensing Contact

David Mallin

Licensing Manager, Physical Sciences

Email