Thin-Film Catalyst Fuel Cell Electrodes with Improved Durability

Wipula Liyanage, Gaoqiang Yang, Siddharth Komini Babu, Alper c. Ince Jacob S. Spendelow

Motivation

Conventional Pt/C catalyst¹:

1. Performance: decrease at high-current density 2. Durability: Carbon/catalyst corrosion Catalyst





Electrode is random mix of:

- Pt/C
- lonomer
- •Void space (pore)

Need fast transport of:

- $\cdot O_2$
- •H+
- e⁻
- •H₂O

Thin Film Electrode

Co-axial nanowire electrode (CANE)²

- Thin film morphology: stabilize Pt against surface area loss Pt-ionomer interface modification: enable faster O₂
- transport, without compromising H⁺ transport
- Avoids C support: improves corrosion resistance









CANE as Reversal Tolerant Anode

In hydrogen starvation conditions, fuel cell performance decreases in minutes, causing a sudden cell failure. Pt/C anode was replaced with CANE electrode:

Material Physics and Applications, Los Alamos National Laboratory, Los Alamos, NM, USA

Anode Reversal Test (ART): Draw a constant current 0.2 A/cm², then at time = 0, $H_2 \rightarrow N_2$

Future work

- etc.) of transport channels

film

- manufacturing
- film

EERE.

References

- B416-B423
- 2) Manuscript in preparation