הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע״ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar

Monday, Sep 18th ,2023, at 13:30

Room 1

Development and Analysis of Thin-Film Solid Oxide Fuel Cells Based on Silicon Compatible Technology

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Mid-PhD Seminar

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Gadolinia doped ceria is an alternative promising electrolyte material for low-temperature solid oxide fuel cells. Its relatively high ionic conductivity below 600 °C makes it attractive as an electrolyte material, although its partial electronic conductivity is a significant drawback. This drawback is more pronounced in ultra-thin layers (sub-micron scale) of solid oxide fuel cell devices. As a result, gadolinia doped ceria has been utilized only to a limited extent for thin-film solid oxide fuel cells. The issue of partial electronic conductivity might be resolved thanks to a non-conventional deposition technique of polycrystalline gadolinia doped ceria thin films. The proposed sputtering technique includes a metallic alloy target and results in a granular morphology, as opposed to the columnar morphology obtained using the conventional sputtering method. As the electrical conductivity of polycrystalline thin films is higher along the grain boundaries, gadolinia doped ceria layers with random crystallographic orientation are expected to be less electronically conductive. Here, we investigated the integration and the performance of granular gadolinia doped ceria as an electrolyte material for thin-film solid oxide fuel cells. The electronic-conduction properties along the grain boundaries of gadolinia doped ceria were studied, and a thin-film solid oxide fuel cell prototype was fabricated. Such devices with engineered grain boundaries hold the potential for low-temperature operation, high power output, and silicone-compatibility for novel integration opportunities and bulk-fabrication.

Refreshments will be served at 13:15.