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The effect of fabrication technique of thin film YSZ/GDC based bi-layer solid oxide fuel cell electrolyte

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Yttria stabilized zirconia (YSZ) and gadolinia doped ceria (GDC) have been reported to be ideal solid oxide fuel cell (SOFC) electrolyte materials due to their outstanding chemical stability and ionic conductivity properties respectively. Notwithstanding these properties, YSZ is known for its low ionic conductivity while GDC exhibit high electronic conductivity and vulnerable to chemical instability. In this study, Anode aluminium oxide-supported thin-film fuel cells having a bi-layered electrolyte consisting of a GDC layer and YSZ layer were fabricated using plasma enhanced atomic layer deposition PEALD technique and electrochemically characterized to investigate the effect of the fabrication technique. The result showed that the PEALD yielded pinhole-free and highly dense thin film YSZ/GDC electrolyte which inhibited electrical shortage and gas leakage. The resulting bi-layered thin-film fuel cell produced a considerably higher open circuit voltage compared with a thin-film fuel cell with a single-layered GDC or bi-layered YSZ/GDC electrolyte fabricated via other methods.

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