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0RGHOOLQJ 3K\VLFDO 9DSRU 'HSRVLWHG 1DQR VFDOHG 1LFNHO Biomass

Waqas Hassan Tanveer
National University of Science & Technology (NUST), Pakistan

Nickel-Gadolinium Doped Ceria (Ni-GDC) cermet anodic thin lms were prepared on zirconia electrolyte supports by two distinct physical vapor deposition (PVD) processes, 1) pulsed laser deposition (PLD) 2) radio frequency (RF) sputtering. For PLD, the deposition was carried out at a target temperature range of 0°C~700°C. For RF sputtering, the target temperature was kept constant at room temperature of 25°C, however the background sputtering gas was Ar:O2/80:20. e fuel cell con guration was completed by screen printing of lanthanum strontium manganite (LSM/YSZ) cathodes on the other side of electrolyte supports. Peak performance comparison of these cells was measured under hydrogen (H_2) source at an intermediate temperature range of 600°C ~ 800°C by voltage-current-power curves. e resistances of various cell components were observed by nyquist plots. Initial results showed that anode thin lms made at increased target temperature, pressure, and high deposition power, performed better than the low powered ones, for a speci c Ar:O_2 pressure. Interestingly, however, anodes made at the highest power and the highest pressure, were not the ones that showed the maximum power output at an intermediate oxide fuel cell temperature range. ese high performance anodes were then tested under the product fuel of CO_2 electro-reduced via biomass carbon obtained from industrial waste(IWC). IWC fuel performance matched up to the H2 fuel performance in terms of peak power density and longevity, with an added lower fuel cost advantage. High resolution transmission and scanning electron microscope 2D images were utilized to understand the three phased (Ni, Ce, Pores) of the cermet anode made by both PVD processes. e electrochemical model was used to simulate the kinetics of nanostructured porous thin lm cermet anodes. Experimental and simulation results were coherent with each other, especially for IWC operated fuel cells working at the upper range of intermediate SOFCs.

ZDTDV KDVVDQ#VPPH HGX