EB-PVD ELECTROLYTE FOR SOLID OXIDE FUEL CELLS

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Recently the research of SOFC operating at intermediate temperatures becomes more popular [1]. Two effective methods can be used to reduce the operating temperature of SOFC from conventional range of above 800°C down to intermediate temperatures (500–600°C). One is to use electrolyte materials with higher ionic conductivity at lower temperature [2], and the other is to use the thin films obtained with, e.g., EB-PVD (electron beam physical vapour deposition) technique [3]

EB-PVD method was applied for the preparation of scandia- and scandia-ceria-stabilized zirconia (10Sc1CeSZ) thin film on a NiO–YSZ porous anode substrate for solid oxide fuel cell (SOFC) applications. Modulus of elasticity dependence on film thickness of angle laps was determined with indentation technique. Scanning electron microscopy and X-ray electron beam microanalysis were used to study structural non-homogeneity of deposited electrolyte films.

It was found that modulus of elasticity vs. thickness has non-monotonous dependence. SEM study of electrolyte films reveals their layered structure (Fig. 1a). Non-homogenous distribution of alloying elements related to electrolyte layers occurs (Fig. 1b). Besides that Ni diffusion from anode support into electrolyte takes place.

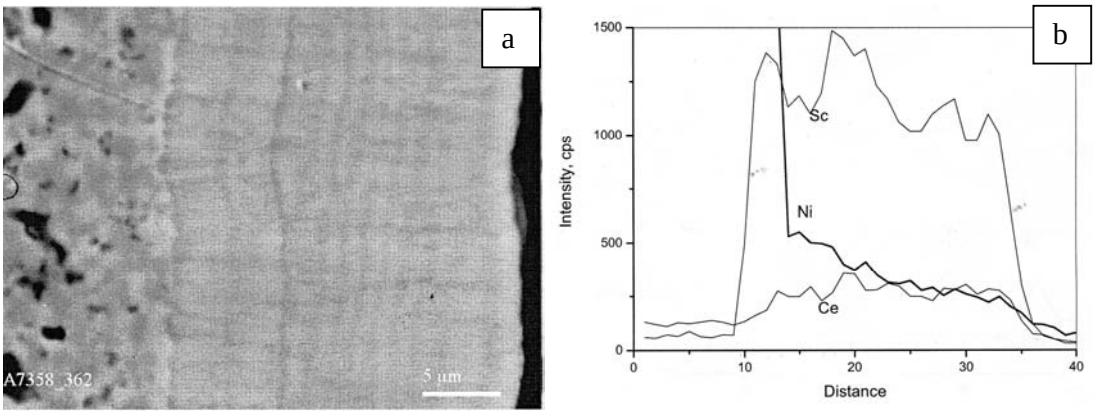

Fig. 1. SEM image (a) and Sc, Ce, Ni distribution of 10Sc1CeSZ electrolyte EB-PVD film.

References

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