INFLUENCE OF STRUCTURE OF Ni-ZrO_2 SOFC ANODE ON ITS ELECTROCHEMICAL PROPERTIES

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It is known that the efficient operation of SOFC anode are strongly depend on its microstructural parameters such as particle size, composition and spatial distributions of the constituent phases. In the work the influence of microstructure on electrochemical properties of Ni-ZrO_2 anode were investigated.

NiO-10Sc1CeSZ composites were made with conventional powder metallurgy method with different amount of NiO: 40-, 65-, 75-wt.%. Catalytic activity of the reduced samples was characterized by conversion of CH_4 into CO_2 and temperature of achievement of the certain level of the conversion of methane.

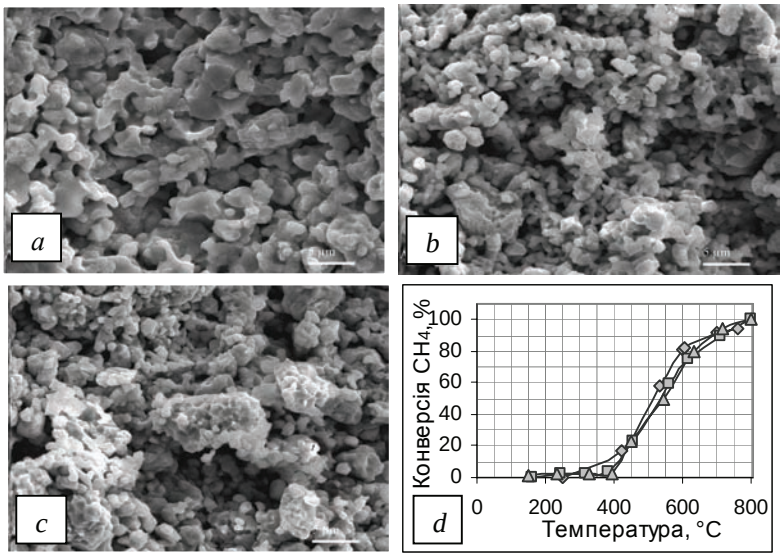

Fig. 1. CEM images of fracture surfaces of reduced anodes made on the basis of 10Sc1CeSZ powder with different NiO content, in wt.%:
a — 40; *b* — 65; c — 75; d – dependence of CH_4 conversion on temperature for anodes with different NiO content (wt. %): ● — 40; ■ — 65; ▲ — 75.

Degradation of composite structure during reducing results in a decrease of its electrochemical properties. Anodes with 40-wt.% NiO showed 50% of CH_4 conversion at 500°C, whereas anodes with 75-wt.% reach the same conversion level only at 550°C. Comparing CH_4 conversion for anodes at 600°C, which is the working temperature of intermediate temperature SOFC, it seems that 40-wt.% NiO–ZrO_2 anode reached conversion over 80%, which is 10% higher than for anodes with 65-, 75-wt.% NiO content. When temperature is above 700°C the NiO content in anodes has no significant influence on its conversion ability.