Nanocomposites and nanomaterials

The influence of composition and structure – size characteristics of Ni-containing nanocomposites based on stabilized zirconia on their catalytic properties in the steam reforming of C_1,C_4 alkanes

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The Ni, Cu-containing nanocomposite catalysts based on stabilized zirconia are prototypes of SOFC anode materials for the direct conversion of hydrocarbon fuels [1]. In this work the activity of such composites was studied in the steam reforming of methane and butane. Also catalysts were characterized using X-ray powder diffraction (XRD), transmission electron microscopy, temperature-programmed oxidation with H_2O and O_2. It was shown that the content of 3*d*-metals (Ni, Cu) 10–20% wt. in the catalysts provides their high activity and stability in the temperature range of 600-800^{o}C (Fig. 1, a, b). The introduction of CeO_2 (10% wt.) and small amount of Pt and Pd (0,1% wt.) leads to increase the activity and resistance to coking of catalysts. According to the XRD data, modification of copper-nickel nanocomposite by CeO_2 prevents a formation of Ni–Cu alloy (L = 28 nm) and increases dispersion of the supported metals (L = 20 - 24 nm), resulting in an increase of catalyst activity in conversion of butane (Fig. 1 b).

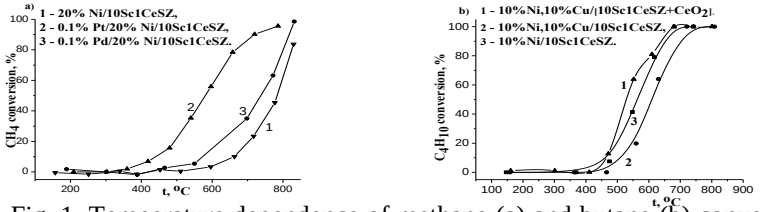

Fig. 1. Temperature dependence of methane (a) and butane (b) conversions in the steam reforming on catalysts based on stabilized zirconia (10Sc1CeSZ).

Thus, the studied Ni, Cu-containing catalysts based on 10Sc1CeSZ, also modified by CeO_2 and Pt, Pd are promising for the development of efficient anode materials of SOFCs operating on hydrocarbon fuels.

1. *Itome M.* Methane oxidation over M – 8YSZ and M – CeO_2/8YSZ (M=Ni, Cu, Co, Ag) catalysts // Catalysis Letters-2006.-**106**, N 1-2.-P. 21-27.