OXYGEN DIFFUSION MOBILITY IN THE $PrNi_{1-x}Fe_x$ CERAMIC SERIES

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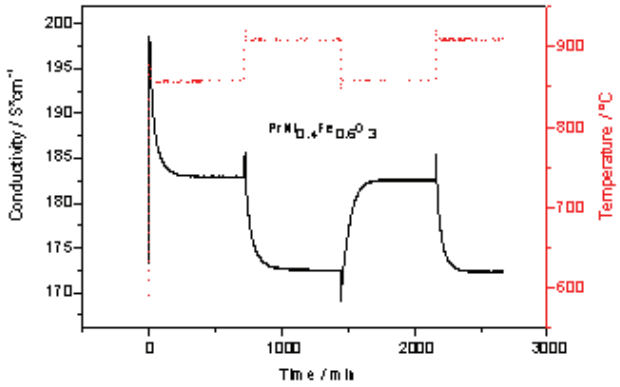
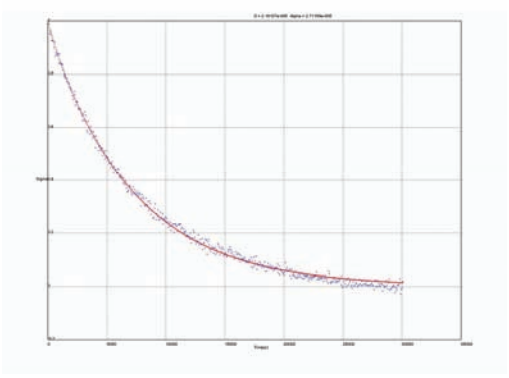
$PrNi_{1-x}Fe_xO_3$ ceramics have high electronic conductivity and could be promising materials for SOFC cathodes [1]. However, only few data about oxygen diffusion mobility for these compounds have been published till now. In the present work we have investigated this parameter depending of cationic composition, temperature and oxygen partial pressure in surrounding atmosphere.

The ceramic powders of $PrNi_{1-x}Fe_xO_3$ (x=0, 0.1,…, 0.9, 1) were synthesised by the solid-state reaction method using corresponding stoichiometric amounts of the constituent metal oxides. Initial mixtures were ball milled and treated at 800–1500°C for 10–17 hours with two intermediate steps of crushing and powdering of the intermediate products. The formation of the single phase powders was confirmed by room temperature X-ray diffraction analysis using Cu-Kα radiation.

Oxygen diffusion mobility some of the gas dense ceramic compositions were investigated by means of a solid electrolyte measurement complex ZirOxySystem (Greifswald, Germany) in the temperature range 20 to 1000°C at pO_2=1–21000 Pa. The relaxations of the electrical conductivity of the gas dense ceramic samples after jumps of temperature and/or oxygen partial pressure were used for calculation of the chemical diffusion coefficients as shown in Fig. 1.



a)



b)

Fig. 1. Time dependence of the conductivity of the gas dense $PrNi_{0.4}Fe_{0.6}O_3$ ceramic sample in Ar/O_2 gas flow at pO_2=6 Pa after temperature jumps (a) normalized experimental (blue) and fitted (red) conductivities (b) for one of the temperature jump steps.

Highest conductivity and oxygen mobility were found for $PrNi_{0.4}Fe_{0.6}O_3$.

References

[1] S. Hashimoto et al., Journal of Alloys and Compounds 428 (2007) 256-261.