# THE INFLUENCE OF STRONTIUM AND COBALT CONTENT ON CRYSTAL STRUCTURE AND PROPERTIES OF $Nd_{1-x}Sr_xFe_{1-y}Co_yO_{3-\delta}$ OXIDES

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In the present work the homogeneity range, crystal structure, oxygen nonstoichiometry, thermal properties and electrical conductivity of partially substituted $Nd_{1-x}Sr_xFe_{1-y}Co_yO_{3-\delta}$ oxides versus temperature, strontium and cobalt content was studied.

A series of samples of overall composition of $Nd_{1-x}Sr_xFe_{1-y}Co_yO_{3-\delta}$ with $x$=0.7 and $0.0 \le y \le 1.0$ and with $y$=0.3 and $0.0 \le x \le 1.0$ and were prepared by glycerol nitrate technology and characterized by X-ray diffraction, thermogravimetric analysis, iodometric titration and dilatometry.

The crystal structure of $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ with $0.0 \le x \le 0.5$ was described as orthorhombic (sp. gr. *Pbnm*). However, the unit cell is distorted, and this gives rise to two types of orthorhombic structure: the O-type is characterized by the relation $a \le c/\sqrt{2} \le b$ or $b \le c/\sqrt{2} \le a$ and O′-type by $c/\sqrt{2} \le a \le b$. The structure is O-type for $0.0 \le x \le 0.1$ and $0.4 \le x \le 0.5$; it is O′-type for $x$=0.3. Thus, with increase in the strontium content to $x$=0.5 the O-orthorhombic – O′-orthorhombic – O-orthorhombic transition was observed. Further introduction of strontium into the neodymium sublattice leads to a change of crystal structure from orthorhombic to cubic and the solid solutions $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ with $0.7 \le x \le 1.0$ have a nearly ideal cubic structure (sp. gr. *Pm3m*). The structural parameters for $Nd_{1-x}Sr_xFe_{1-y}Co_yO_{3-\delta}$ were refined using Rietveld full-profile analysis. The sample with strontium content $x$=0.6 was multiphase and consisted two type of solid solution with cubic (sp. gr. *Pm3m*) and orthorhombic (sp. gr. *Pbnm*) structures.

The changes of oxygen content in $Nd_{1-x}Sr_xFe_{1-y}Co_yO_{3-\delta}$ with $x$=0.7 and $0.0 \le y \le 1.0$ and with $y$=0.3 and $0.0 \le x \le 1.0$ versus temperature were determined by thermogravimetric analysis. It was founded, that substituting strontium in place of neodymium results in significantly increases of the oxygen deficiency, and while an introduction of cobalt for iron sites slightly increase it. Sr- and Co-substitution promote oxygen desorption since they act as acceptor of electrons.

The thermal expansion measurements of the $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ ($0.0 \le x \le 0.5$) were performed. The values of average thermal expansion coefficients of the $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ within the temperature range 298–1273 K in air varied from $16.46 \times 10^{-6}$ $K^{-1}$ to $25.1 \times 10^{-6}$ $K^{-1}$. Chemical expansion constituent was separated.

The electrical conductivity of $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ ($0.3 \le x \le 0.7$) increases with temperature increase and reaches a maximum, and then decreases with a further in-

crease of temperature. The temperature of the maximum became lower with decreasing the strontium content. At relatively low temperatures when oxygen exchange between the $Nd_{1-x}Sr_xFe_{0.7}Co_{0.3}O_{3-\delta}$ oxides and gaseous phase is negligible the increase of electrical conductivity can be explained by increasing concentration of the electronic charge carriers due to the intrinsic charge disproportion of 3*d*-transition metal. Further increase of temperature leads to a significant increase of oxygen vacancies and concentration of the most mobile electronic holes decreases.

## ПОЛУЧЕНИЕ НАНОПОРОШКОВ $SiO_2$, ДОПИРОВАННЫХ C И Cu И ИССЛЕДОВАНИЕ ИХ ЛЮМИНЕСЦЕНТНЫХ СВОЙСТВ

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## OBTAINING NANOPOWDERS $SiO_2$ DOPED WITH C AND Cu AND THEIR LUMINESCENT PROPERTIES

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Obtaining nanopowders by pulsed electron evaporation method in a vacuum, the study of thermally stimulated luminescence of silica samples doped with impurities of carbon and copper are presented.

На сегодняшний день, в связи с широким применением радиоактивных веществ и разного рода источников ионизирующего излучения (ИИИ), все чаще возникает необходимость воссоздания дозы облучения, которую приобрел в прошлом тот или иной объект. Диоксид кремния, обладающий хорошей чувствительностью к ионизирующему излучению, широко используется в различных сферах деятельности человека.

В настоящее время не исследованы вопросы измерения дозиметрических свойств оксида кремния в виде нанопорошков, не имеется данных об их люминесценции. Данная работа посвящена изучению импульсной катодолюминесценции (ИКЛ) и термолюминесценции (ТЛ) нанопорошков (НП) $SiO_2$, допированных углеродом и медью.