OPTICAL PROPERTIES AND CONDUCTIVITY OF LANTHANUM SCANDATE IN HYDROGEN CONTAINING ATMOSPHERES. INFLUENCE OF DIFFERENT WAYS OF INTRODUCING OXYGEN NON-STOICHIOMETRY

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Acceptor-doped oxides with perovskite structure ABO_3 are widely used as a proton conducting materials in different high-temperature electrochemical devices [1]. The common way how protons can be introduced into oxide is interaction between this oxide and water vapor (H_2O) [2]. Generally accepted mechanism of hydration is described by the following equation in the Kröger-Wink notation [1, 2]

$$H_2O + V_O^{\bullet\bullet} + O_O^X = 2OH_O^{\bullet} \quad (1)$$

However, protons also can be introduced into oxide from dry H_2 atmospheres [2], and this case is much less studied. Recently we have shown that Sr-doped lanthanum scandate ($La_{1-x}Sr_xScO_{3-x/2}$) can uptake protons from H_2 gas phase [3] and studied its optical properties under such uptake [4]. We found that efficiency of such uptake as well as behavior of optical properties depends on concentration of Sr, i.e. concentration of oxygen vacancies [3, 4]. However, oxygen vacancies can be introduced into scandate not only by doping A-sublattice, but also B-sublattice, both A- and B- sublattices, and by specifying deficiency of cations. Therefore, in the present research we aim to study efficiency of proton uptake from dry H_2 atmosphere and optical properties of lanthanum scandate under different ways of introducing the same amount of oxygen vacancies.

It is found that in dry H_2 atmosphere conductivity of lanthanum scandate doped in both cation sublattices with Sr and Mg correspondingly is about one order of magnitude lower than for only Sr-doped sample. Results of optical properties study show that absorption near fundamental absorption edge appeared due to acceptor doping is composed of two bands. Phase of doped only into Sc-sublattice lanthanum scandate is much less stable and decomposes into phases of perovskite and lanthanum oxide. Other results on La-deficient lanthanum scandate are also presented.

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