MIXED CONDUCTING NONSTOICHIOMETRIC PEROVSKITES AS NANOSTRUCTURED SYSTEMS

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Mixed oxygen/electron conducting perovskites are promising materials for oxygen permeable membranes and electrodes for SOFC. It is known that cobaltites and ferrites and mixed composition $SrCo_{1-x}Fe_xO_{3-z}$ possess anomalously high oxygen transport properties [1].

According to our approach high oxygen transport properties of these nonstoichiometric perovskites related to their microstructure which is characterized by high density of domain walls, twin and anti-phase boundaries (Fig.1). It is know that changes in the local electric fields and appearance of spontaneous mechanical stresses in the vicinity of the interfaces can be the reason of a substantial decrease in the activation energy of oxygen migration along domain boundaries, which can provide high diffusivity paths for oxygen transport in this case [2].

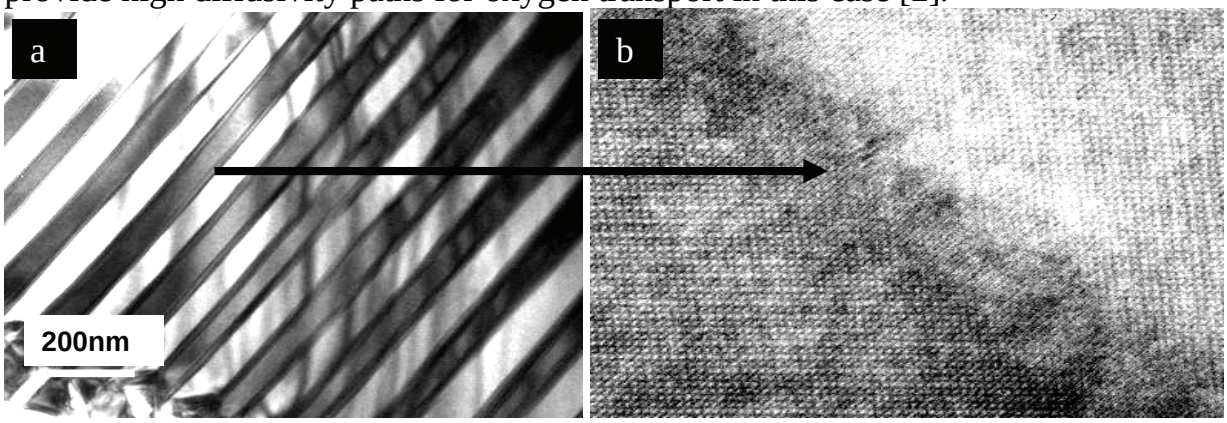

Fig.1. Dark field image and HREM picture of $SrCo_{0.8}Fe_{0.2}O_{3-z}$ perovskite possesses high oxygen transport properties: a – nano-sized twins, b – twin boundary.

Since nonstoichiometric substituted perovskites in terms of defects (oxygen vacancies and dopants) can be considered as oversaturated solid solutions and possess ferroelastic properties there are two possible mechanisms of the formation of high density of domain boundaries: spinodal decomposition and nanotwinning.

We will present the results obtained by using this approach to modify the functional properties of $SrCo_{0,8}Fe_{0,2}O_{3-z}$ and $SrFeO_{3-z}$ perovskites by means of partial substitution of Co/Fe ions and strontium for the cations of Al, Nb, Ta, Mo, W and La, Ca, respectively

References

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