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Title :

Effects of Local Strain on Oxide Ionic Conductivity in Cu- and Ga-doped $Pr_2NiO_{4+\delta}$ film laminated on Sm-doped CeO_2

Nano size effects in mass transportation property of oxide ion are attracting much interest recently. As the one of the reasons for improved conductivity, residual strain in crystal lattice was considered. However, the detail between enhanced conductivity and residual strain was still not clear. In this study, their relationship was investigated in the Cu- and Ga-doped Pr_2NiO_4 (PNCG) which was laminated with Sm-doped CeO_2 (SDC).

Raman spectroscopy was measured to confirm the detail of tensile strain. From the mapping of peak position, the distribution of strain could be imaged. As a result, the SDC layer on the grain boundary of MgO substrate had no strain, and only the SDC layer on MgO grain was tensile, which suggested that oxide ion transportation might be faster than SDC deposited on MgO grain boundary.

To confirm the oxygen mobility, oxygen tracer diffusivity was measured along the film, and across the film using isotope oxygen exchange technique. It was found that tensile SDC part had faster diffusion. Therefore, tensile strain might have a possibility to increase the oxygen mobility.