Humidity and e oxygen diffusion in $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3+\delta}$

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Here, the oxygen transport behaviour of dense $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3+\delta}$ (LSCF) polycrystalline samples is compared in dry and humid oxygen below 500˚C. Isotopic-Exchange-Depth-Profiling (IEDP) is performed with dry labelled $^{18}O_2$ or with $H_2{}^{18}O$ under a partial pressure of oxygen of 0.20 bar. The oxygen transport parameters are followed in the temperature range from 351 to 496˚C as a function of the partial pressure of vapour, of the pre-annealing time and sintering cooling rate. It is found that water vapour not only influences the oxygen surface exchange kinetics, but also the bulk diffusion of dense LSCF ceramics at low temperature. The diffusion coefficient measured in humid oxygen can be up to three order of magnitude higher than in dry oxygen. Thermodynamic aspects, the evolution of the oxygen vacancies concentration and the role of protons are discussed.