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Surface exchange polarization vs. gas concentration polarization in permeation through mixed ionic-electronic membranesM.C. Steil^{a,b*}, J. Fouletier^{a,b}, P.-M. Geffroy^c^aUniv. Grenoble Alpes, LEPMI, F-38000 Grenoble (France)^bCNRS, LEPMI, F-38000 Grenoble (France)^cCNRS, ENSCI, SPCTS, UMR 6638, 47 à 73 Avenue Albert Thomas, 87065 Limoges, France

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Abstract

The rate-limiting steps for oxygen permeation flux through mixed ionic-electronic conductors are generally bulk diffusion and surface exchange reactions. Many existing permeation models do not consider the deviation from equilibrium caused by the gas phases of both membrane interfaces. This study describes a set-up to measure the actual oxygen activity on the surface of an oxide, which is generally obviously different from the oxygen pressure in the close vicinity of the surface. Examples that experimentally demonstrate the role of surface polarization ascribed to oxygen permeation are described. Finally, the surface exchange polarization on a perovskite membrane due to the permeation process is compared to the concentration polarization due to oxygen diffusion in the gas close to the membrane surface.

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