

Fabrication and analysis of ions diffusive transport through nanoporous ceramic membranes: Influence of pore size, porosity and surface material

V. Romero¹, L. Gelde¹, I. Llamas¹, V. Vega², J. García^{2,3}, V.M. Prida², B. Hernando², J. Benavente¹

¹ Dpto. Física Aplicada I. Facultad de Ciencias, Universidad de Málaga, E-29071 Málaga, Spain.

² Dpto. Física. Facultad de Ciencias, Universidad de Oviedo, E-33007 Oviedo, Spain.

³ Institut für Angewandte Physik, Universität Hamburg, Jungiusstraße 11, 20355-Hamburg, Germany

Manufacture of Nanoporous Alumina Membranes (NAMs) by the two step anodization method allows the attainment of well-defined porous structures [1-2]. Moreover, the possible modification of geometrical parameters (pore size and porosity) and membrane surface material by Atomic Layer Deposition (ALD) technique by using different kind of nanoparticles (SiO₂, Al₂O₃, ZrO₂,...[3-4]) has increased the range of applicability of these systems. In this work we report the manufacture, geometrical characterization by SEM micrographs and the analysis of the diffusive transport of ions (Cl⁻ and Na⁺) through the nanopores of different membranes, which is correlated with the porosity/pore radius of the membranes and the material covering their surfaces. This latter analysis was performed by measuring membrane potential with NaCl solutions at different concentrations, which give information on the diffusive flow through the pores and the effect of membrane charge on mass/ion transport. In this context, Donnan exclusion of the co-ions at the solution/membrane interface seem to exert a significant control on the diffusive transport at low NaCl concentrations, while the increase of the electrolyte concentration shows a partial reduction of the electrical effects and the increase of diffusive contribution.

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