Characterization of Nafion-Based Composite Membranes by *In-Situ* AFM

D. F. dos Santos[1], M. L. Munford[1], B. R. Matos[2], M. A Dresch[2], E. I. Santiago[2], M. Linardi[2] and F. C. Fonseca[2]

[1] *Departamento de Física - UFV, MG, Brazil*

[2] *Instituto de Pesquisas Energéticas e Nucleares - IPEN-CNEN/SP, São Paulo SP, Brazil*

[3] *UFABC, SP, Brazil*

Nafion® is a sulfonated tetrafluorethylene copolymer widely used as the electrolyte in proton exchange membrane fuel cells (PEMFC) [1]. Such devices are potential candidates for future efficient and environmentally friendly energy production. The incorporation of oxide nanoparticles in these membranes can increase significantly the operation temperature of PEMFC above the usual temperature of ~80 ºC. Several significant advantages of high operating temperatures, in the range of 100-150 ºC, are related to a better overall efficiency of the system and to the utilization of liquid fuels, which are considered as important achievements for a widespread application of PEMFC [2, 3]. In this work, atomic force microscopy (AFM) was employed to characterize the morphology of Nafion-based composite membranes surfaces. The AFM experiments were performed under noncontact mode, *in-situ* (distillated-deionized water) at ambient temperature. Nafion membranes prepared by both sol-gel and casting methods, with the addition of ceramic nanoparticles (titania and silica), were studied. The results show that the size and distribution of nanoparticles in the membranes are strongly influenced by the method of preparation of these composite membranes.

Keywords: Nafion, in-situ AFM, PEMFC.

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email: munford@ufv.br, Departamento de Física – CCE – UFV, Prédio CCE, Ala A, Av. P.H.Rolfs, s/n, Campus UFV.