ORDERED ASSEMBLY OF OXIDE NANOTUBES IN A POROUS ALUMINA MEMBRANE

M.P. Proenca, C.T. Sousa, A.M.L. Lopes, D.C. Leitao, J. Ventura, J.B. Sousa, J.P. Araujo
Dep. Física and IFMUP, Rua do Campo Alegre 687, 4169-007 Porto, Portugal
mippro@gmail.com

Nanoporous alumina membranes are an easy-made product that has attracted much interest in these last years. They can be used as templates for well ordered growth of nanowires, nanotubes, nanorods and nanodots, thus providing a wide range of applications in areas such as medicine [1] (biosensors, photocatalysts), electronics (ultrahigh-density magnetic memories, optoelectronic devices), energy storage (solar cells).

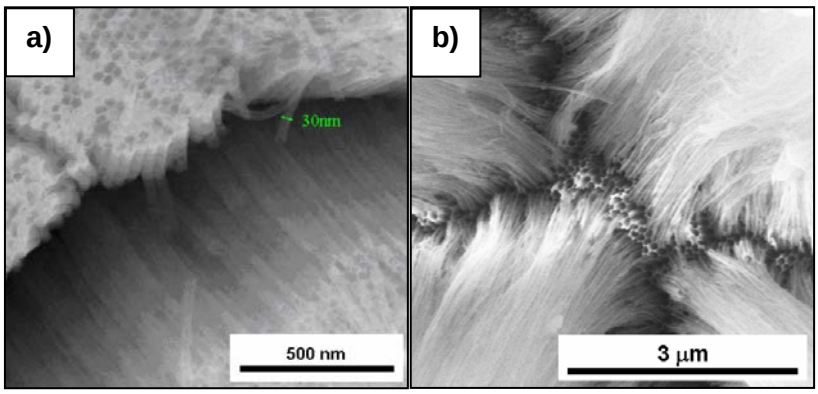
In this work we used nanoporous alumina membranes to produce two types of oxide nanotubes: silica (SiO2) [2] and perovskite manganites (CaMnO3) [3], via the sol-gel template method. These templates can be easily fabricated using adequate anodization conditions and the pore size and interpore distance easily varied. Furthermore, their use for growth of nanotubes has enormous advantages: the possibility to build a net of aligned and ordered nanostructures, the chance to fill or functionalize their inner side without affecting their outer surface and the ability to control the dimensions required. Using this method, not only can we control the length of the nanotubes, but we can also control their diameter and thickness, allowing us to vary these characteristics along their surface.

We will present an optimization study of the sol-gel template method using nanoporous alumina membranes allowing to achieve high quality oxide nanotubes and nanowires of SiO2 and CaMnO3, varying template characteristics such as pore and interpore sizes, as well as sol-gel parameters such as temperature, concentration, viscosity and deposition time. The developed methods can be adequately applied to other oxides.

References:

[1] S.J.Son, X.Bai and S.B.Lee, Drug Discov. Today, **12** (2007) 650.
[2] D.T.Mitchell, S.B.Lee, L.Trofin, N.Li, T.K.Nevanen, H.Soderlund and C.R.Martin, J. Am. Chem. Soc., **124** (2002) 11864.
[3] P.Levy, A.G.Leyva, H.E.Troiani and R.D.Sánchez, Appl. Phys. Lett., **83** (2003) 5247.

Figures:



SEM images of silica (a) and manganite (b) nanotubes obtained by the sol-gel template method.