Controlled fabrication of nanotubes from nanoporous anodic alumina

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Recent decades brought significant advances in the field of nanoporous materials. High surface area, well-defined pore size and functionalization possibilities are just a few of many features making nanoporous materials attractive in broad range of applications like catalysis, biomaterials and template to fabricate different nanostructured materials. Electrochemical anodization of aluminium is affordable and effective method to fabricate nanoporous structures made of anodic alumina. Tuning parameters of the process like voltage, current, electrolyte used and duration of the process, structures varying in shape and size can be synthesized [1]. Growing knowledge about effects of different parameters on characteristics of obtained structure led to design of more sophisticated fabrication methods, leading to creation of complex structures like nanopillars, funnels or rugate structures [1-3].

In this communication, we present fabrication of hollow-inside anodic alumina nanotubes. Pulse anodization is performed in galvanostatic conditions, consisting of interlacing high- and low current density pulses. Such structure is subjected to etching in mixture of $CuCl_2$ and HCl in order to remove remaining aluminium and weaken connection between individual layers of structure, followed by gentle sonication in water to liberate nanotubes. Fabricated nanoparticles present low dispersity of size and their lenght can be tuned adjusting pulse anodization parameters [4]. Due to inert character of alumina and optical properties, such nanoparticles may find application in fields like biomaterials or photonics [4,5].

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Figures

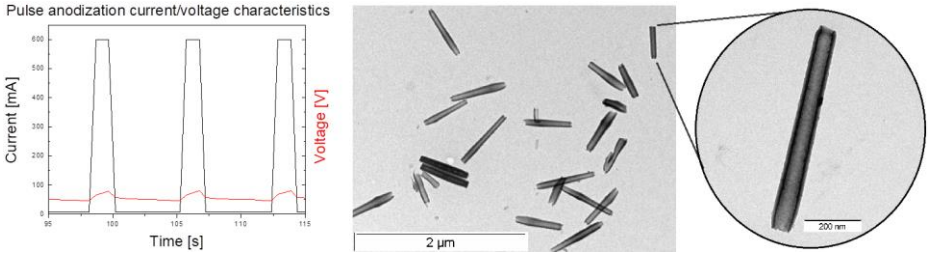

Figure 1: From the left: Current/voltage over time characteristic for galvanostatic pulse anodization, TEM image of water suspension containing anodic alumina nanotubes and magnified image of singular nanoparticle.