

Nanofibers and Nanotubes by Template Wetting

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General introduction

The method of template wetting allows one to fabricate highly ordered arrays of 1D structures from different materials. The structures obtained can be used, e.g., in solar cells and other electronic devices. The project is devoted to the fabrication of organic nanofibers and nanotubes on different substrates, by means of template wetting. It also includes the preparation of porous anodic alumina films which are subsequently used as templates.

Research results

A number of porous anodic alumina (PAA) films on silicon substrates (see Figure 1) have been produced. The procedure has been optimized for the case of oxalic acid as an electrolyte. Several supported porous templates with the use of sulphuric acid as an electrolyte have also been made. Free-standing PAA membranes for the further fabrication of metallic nanorods by means of electrochemical deposition have been produced. A new anodization device which allows to work with strong acids at different temperatures has been installed at Alsiom.

Some of the obtained PAA films were used for the fabrication of organic nanofibers by means of template wetting. In particular, nanofiber arrays from dioctyl substituted polyfluorene (PF8) and zinc phthalocyanine (Zn Pc) were fabricated (see Figure 2).

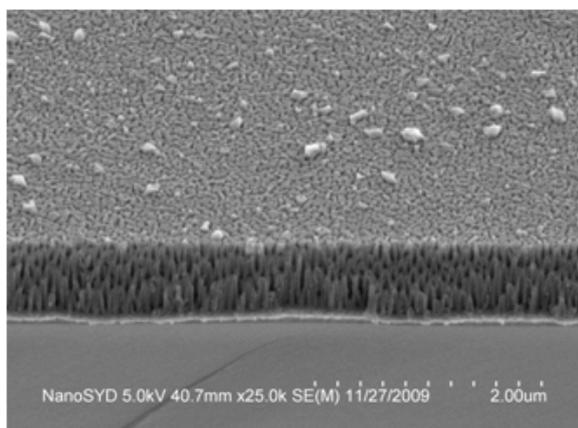


Figure 1. SEM image of a PAA template on a silicon substrate

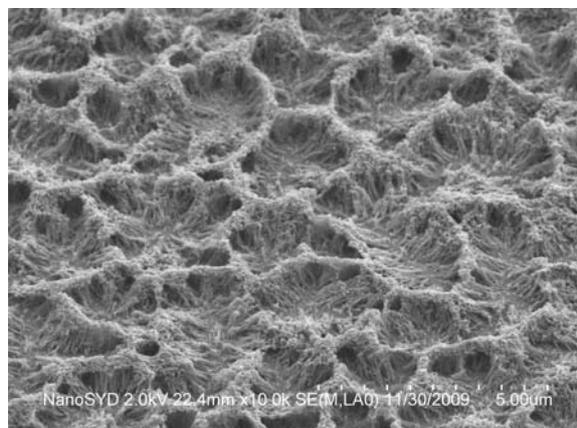


Figure 2. SEM image of a ZnPC nanofiber array fabricated by means of template wetting

2 examples of fabricated tubes and fibres



Figure 3. Polyfluorescent nanotubes.

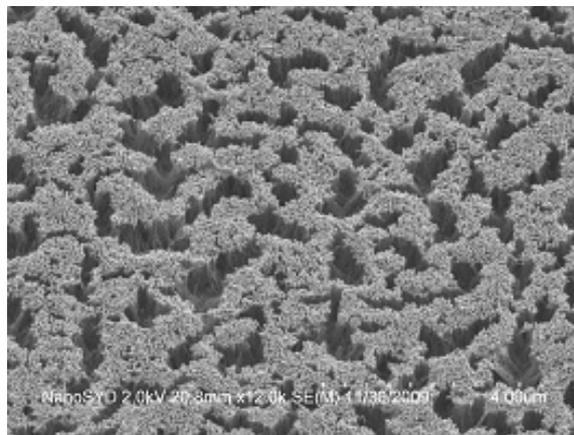


Figure 4. ZnPC nanofiber array from a thin anodised film on silicon.

Upcoming research 2010

It is planned to continue the fabrication of nanofiber arrays for solar cell applications, using different organic substances. Further improvement of the anodization procedure, including two-step anodization and electropolishing of the initial substrates, will be also tried.

Papers

- [1] K.V. Bordo, M. Es-Souni, S. Habouti, M. Schiek, H.-G. Rubahn, *Mesoporous thin film templates for the synthesis of nanowires and nanotubes*, 3rd International Workshop on Smart Materials & Structures, Kiel, Germany, August 19-21, 2009. Book of abstracts.
- [2] K.V. Bordo, M. Es-Souni, S. Habouti, M. Schiek, H.-G. Rubahn, *Mesoporous thin templates for the synthesis of nanowires and nanotubes*, Chemistry and Physics of Materials for Energetics. A European School in Materials Science. Milano, Italy, September 14-19, 2009. Book of abstracts.