Photoelectrochemical Properties of High-Aspect Ratio Titania Nanotubes

Latika Menon
Northeastern University, Boston, MA 02115

Titania nanotubes show great promise in several applications such as in the photocatalysis, gas sensing and biological applications. We have developed a new synthesis route for the production of ultra-high aspect-ratio (over 1000:1) titania nanotubes by anodization in chloride containing acid solutions[1]. The fabrication process occurs rapidly, in a fraction of the time in comparison with other methods such as anodization in the highly toxic fluoride-containing electrolytes[2-4]. We have demonstrated nanotubes with diameters as small as 25 nm, and lengths of the order of 50 microns (see Figure). Typically, the tubes contain some amount of carbon content through the addition of organic acids in the electrolyte. Various synthesis conditions (pH, chloride content, electrolyte nature), and their influence on morphology, composition, and crystalline structure have been studied for fabrication of tubes with optimum parameters[5,6]. Preliminary results on photocurrents and optical properties have been obtained which point to potential applications in the solar production of hydrogen.

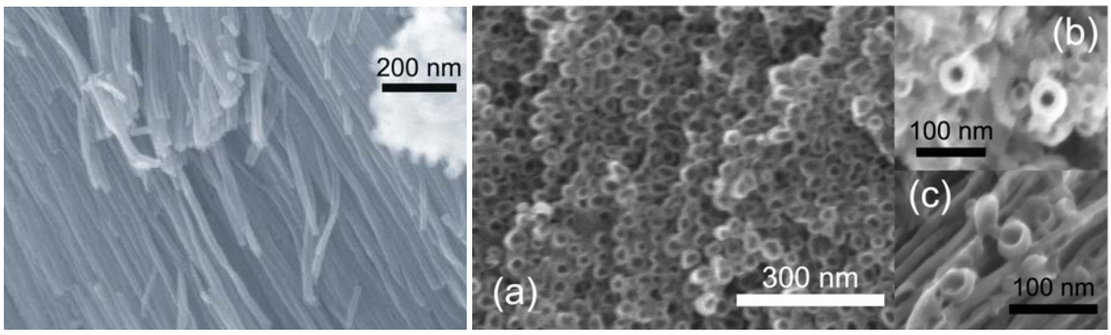

Figure: SEM image (side and top view of the high aspect ratio titania nanotubes

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