STABLE TiO_X SUB-MICROMETER CHANELLS

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Channel architectures of sub-micrometer sizes have potential applications in many fields [1]. In a previous work [2], stable, hollow sub-micrometric structures were patterned in films deposited by PECVD. The obtention of sub-micrometer, stable channels of r.f. sputtered titanium oxide films with different stoichiometries is described in this work. The structure was obtained by holographic exposing a photoresist, depositing the film and subsequentely dissolving the photoresist.

The AZ1518 photoresist was spin coated onto glass substrates, of dimensions 2.5 vs 2.5 cm. The samples were pre-beaked for 20 min at 70 °C and then exposed in a stabilized holographic setup using the 458 nm line of an Ar laser. Masks with patterns of 0.3μm height and a period of 1μm were used. After exposure the samples were developed in AZ 351 diluted in de-ionized water. In sequence, films of titanium oxide were deposited by r.f. magnetron sputttering from a titanium target, under an O_2-Ar atmosphere. \in order to obtain films with different stoichiometries, both pressure and power were maintained at constant values, and the O_2 flow (ϕ) was varied by means of a controlled flowmeter. Thickness of the films were around 100 nm, as measured by profilometry. Finally, for removal of the photoresist, the samples were immersed in acetone.

Analysis by X-ray diffraction showed that all films were amorphous (or nanocrystalline). The spectral transmittance data are consistent with films presenting distinct stoichiometries.

Figure 1 show the SEM photographs for films deposited under different O_2 flow. The submicrometer channels were stable for all samples, in the whole extension of the mask, and present uniform walls, particularly at low ϕ. Preliminary work performed with thinner films (~10 nm) indicate that this stability is not maintaned for all thickness.

Samples were also deposited onto conducting substrates (ITO/glass), with excellent results (Fig. 2). Since TiOx is a well-known electrochromic material [3], this result open the possibility of exploring optoelectrochemical devices with optimized performance.

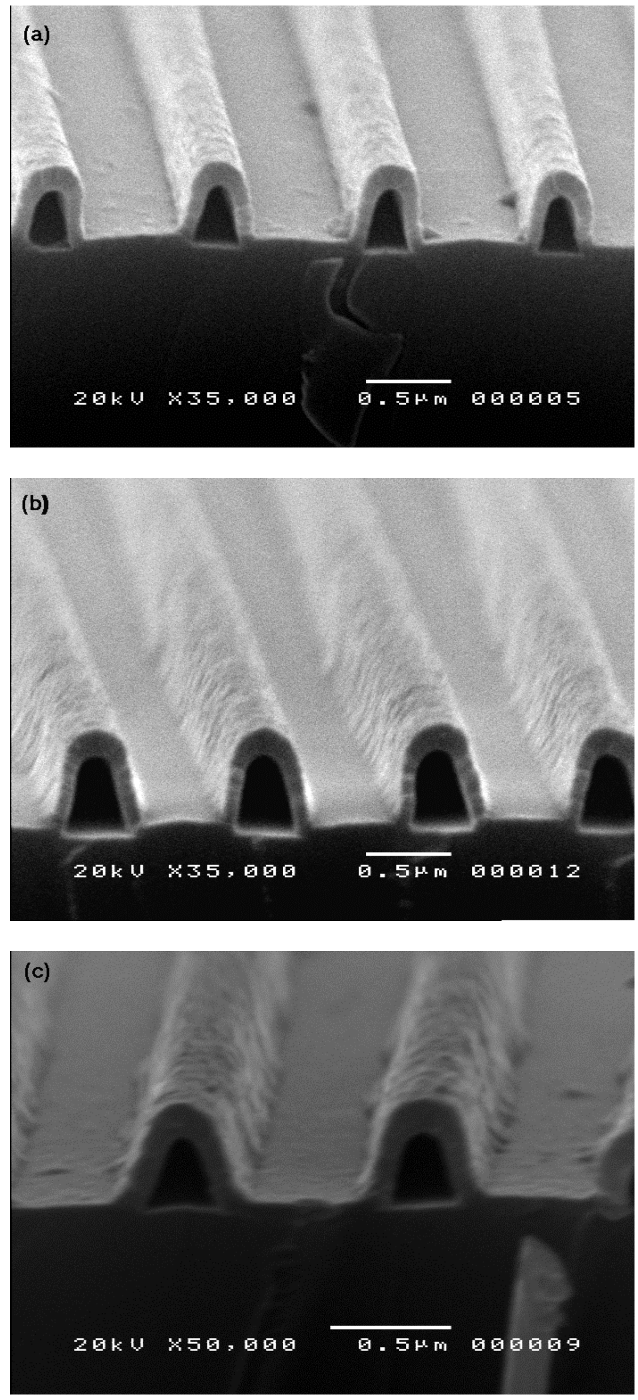

Figure 1 - SEM photographs of TiO_x samples deposited at different O_2 flows (ϕ). (a) ϕ=1.0 sccm; (b) ϕ=1.6 sccm; (c) ϕ= 2.2 sccm

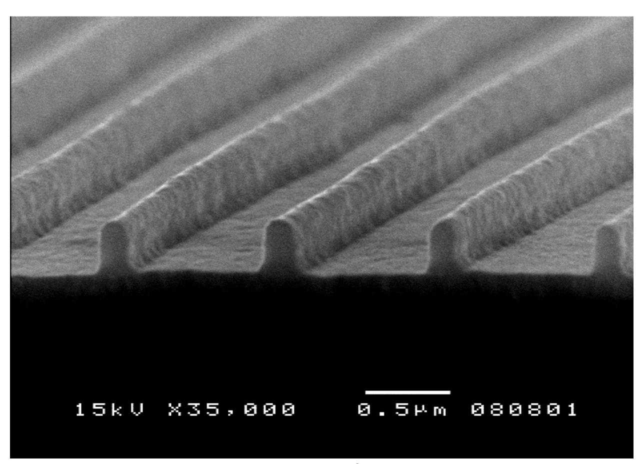

Figure 2 - SEM photograph of TiO_x sample deposited onto ITO/glass substrate.

References

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