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Synthesis of nanostructured FTO for DSSC application

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Introduction

In order to improve the electron transport from photoelectrode nanocrystalline material to conduction substrate, commonly used commercial substrate was replaced by nanostructured F-doped tin oxide (FTO). 1-D nanomaterails of FTO facilitate electron transport by providing a direct conduction pathway rather than nanoparticles and interfacial contact with the deposition of photoelectrode nanocrystalline material. Therefore, in this research, we have accomplished the preparation of various nanostructures by using the atomized spray pyrolysis technique.

Experimental

In the present study, the pulsed spray is impinged over the heat substrate about 500°C, where the aerosol vapour stream sweeps substrate surface in the horizontal direction. The precursor solution is composed of $SnCl_4.5H_2O$, NH_4F, acetone, HCl and distilled water. The spray was done with continuous pulses of 2 s on 13 s off for different total time periods.

Results and Discussion

The material formed on soda lime glass, during 4 min sprays over 30 min, consists of regular elongated hexagonal type nanocrystallites with an average film thickness of ~200 nm. The crystallites become more symmetrical with the spraying period. Spray time of 8 min, over 1 h spray, produces FTO nanotubes as shown in Fig. (a) which are not cylindrical but hexagonal in cross-section. Over 2 h, produces pencil-like nanorods, due to the filling of the hollows insides of the nanotubes. 24 min spray, over 3 h, results in the production of extensively cross-linked, pencil-like nanorods, covering the upper surfaces of these nanorod arrays as shown in Fig. (b). The materials obtained were characterized by SEM, XRD and XPS measurements.