

In situ growth of titania films by spray deposition for solid-state dye-sensitized solar cells

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Titanium dioxide is a wide band gap transition metal oxide semiconductor with applications in photocatalysis, photovoltaic devices, sensing and biomedical applications. Of particular interest is the fabrication of mesoporous titania thin films for application in photovoltaic devices such as dye sensitized solar cells, due to cheap and easy manufacturing, the electronic properties and a high chemical stability. Morphology control of the mesoporous titania layer is tightly linked to the solar cell efficiency, because electron transport will strongly depend on morphology. With respect to application, it is important to expand the fabrication in laboratory to a large scale film preparation. A widely used technique for this purpose is spray coating. The current work presents a study on the morphology of mesoporous titania films prepared by spray coating. We use grazing incidence small-angle X-ray scattering (GISAXS) in-situ during spray coating. GISAXS provides quantitative information about changes in the size of the titania particles and the distance between them during spraying. From the analysis of the in-situ GISAXS data, the growth of the titania films is determined.

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