

EFFECT OF STRUCTURAL MISALIGNMENT IN ORIENTED TiO₂ NANOTUBE ARRAYS ON CHARGE TRANSPORT, RECOMBINATION AND LIGHT HARVESTING IN DYE-SENSITIZED SOLAR CELLS

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Semiconductor materials at the nanometer scale have received considerable attention for possible electrochemical and photoelectrochemical applications, such as sensors, photocatalysis, and solar cells. Interest in photoelectrochemical solar cells has focused mainly on dye-sensitized nanocrystalline solar cells (DSSCs). Typically, the nanocrystalline films consist of randomly packed particles. Transport is limited in these films by the residence time of electrons in surface traps and the morphology of the particle network. Recently, there has been growing interest in understanding the effect of ordered nanostructured architectures on electrical and optical properties of DSSCs.¹⁻³ In this presentation, we describe how changes in the alignment of supposedly oriented arrays of TiO₂ nanotubes influences transport, recombination, and light harvesting in DSSCs.⁴ Nanotube arrays were prepared by electrochemically anodizing titanium foil in a fluoride-containing electrolyte. Changes in the post-growth treatment are found to affect significantly the film morphology. The underlying mechanisms for the correlation between film morphology and electron dynamics/device performance are discussed.

References

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