Influence of Film Geometry, Trapping, and Electron-Electron Interaction on Transport and Recombination in Sensitized Nanostructured Solar Cells

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Electron transport and recombination are major determinants of the overall efficiency of photosensitized TiO_2 nanoparticle solar cells. For optimal performance, the transport of the photoinjected electrons through the nanoparticle network must be significantly faster than their reaction with redox species in the electrolyte. It is, therefore, critical to elucidate the factors that govern the transport and recombination kinetics in such nanostructured films as a basis for improving the performance of dye-sensitized solar cells. Toward this end, we have recently conducted studies aimed at understanding the influence of the network geometry on the electron transport dynamics and the relationship between recombination and transport. We have also examined whether electron-electron interaction has a significant effect on the transport dynamics. In this talk, we highlight the major findings of these studies.