TAILORING INTERFACES FOR EFFICIENT LIGHT-TO-ELECTRICAL ENERGY CONVERSION IN DYE-SENSITIZED SOLAR CELLS

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This presentation will summarize recent advances in the design and fabrication of photo-electrode/solution interfaces that facilitate the generation of high photocurrent densities (20 mA/cm2 in some instances) and high photovoltages in dye-sensitized solar cells (DSSCs) featuring organic chromophores. Key to advances at Northwestern has been the utilization of atomic-layer deposition (ALD) and related techniques to modify and define interfaces in highly spatially resolved fashion. From ALD-centered studies the competing roles of surface defect states, barrier-layer tunneling, barrier thermal population, and dye-facilitated superexchange in detrmining electron interception dynamics and, therefore, photovoltages have been explored. Representative illustrative results, particularly pertinent to the operation of comparatively high efficiency DSSCs, will be described.

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