

Elucidation of Energy and Charge Transport Mechanisms in Layered Perovskites with Nonlinear Action Spectroscopies

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Interest in layered perovskite quantum wells is motivated by their potential for use in optoelectronic devices. In the systems, the smallest and largest quantum wells are most concentrated near opposing electrodes in photovoltaic cells (i.e., glass and air interfaces of a film). The resulting gradients in the band gaps and energy levels have been suggested to promote the long-range funneling of both electronic excitations and free carriers. In this talk, I will describe the development of nonlinear action spectroscopies designed to elucidate the multitude of relaxation processes induced by light absorption in layered perovskite systems. Two-dimensional action spectroscopies are used to correlate elementary relaxation mechanisms to practical metrics of device performance. We envision the development of a new family of experiments that combine multidimensional laser spectroscopies with device measurements.