Materials Science

**TEMPERATURE-DEPENDENT STUDY OF ENERGY TRANSFER AND DIFFUSION IN POLYELECTROLYTE MULTI-LAYER THIN FILMS.** Michael Stocker, Peter K. Walhout,*
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Polyelectrolyte multi-layered thin films (PMLs) show great technological promise as a means of controlling thin film structure down to the order of several angstroms. The layered thin films, which are held together by electrostatic interactions, provide a versatile new material that is readily functionalized by incorporation of various polyelectrolytes and other charged molecules, including dyes and nanocrystals. One such application is in the area of photovoltaics, where dye molecules would serve as light harvesters.

This work utilizes fluorescence spectroscopy to measure the temperature-dependence of the spectral properties of rhodamine B and fluorescein in a prototypical PML thin film made of poly(diallyldimethylammonium) chloride and poly(styrene sulfonate). Additionally, an energy transfer system was setup in a series of films where the distance between the fluorescein donor layer and the rhodamine B acceptor layer was varied. Diffusion was measured by covalently tagging one layer with fluorescein while the rhodamine B was freely incorporated. At temperatures up to 150ºC the rhodamine molecules will move transversely through the film and diffusion constants can be extracted based on the time-dependent change in energy transfer from the stationary fluorescein. These studies of dye diffusion are important for future applications but also probe the basic polymeric viscoelastic behavior of these new materials.