Electron Transfer Mediated by Ionic Conjugated Molecules in Optoelectronic Applications

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Ionic functionalities in conjugated macromolecules and organic chromophores often enable to induce the molecular self-organization, thereby providing the controllability over the functions of some optoelectronic devices. In this presentation, the enhanced efficiency of electroluminescence or sensitivity of photo-fluorescence is introduced in aspects of electron transfer mediated by two examples of the molecular self-assembly. For the light-emitting diode application, cationic conjugated polyelectrolytes or didodecyldimethylammonium ions with different counter anions was used for directing the electron injection from a cathode, and showed that the distribution of ionic pairs at the electrode interface might change the electron injection mechanisms. In the other application of voltage sensitive dyes for cell membrane potential detection, a multivalent distyrylbenzene chromophore was incorporated into model lipid vesicles. Its structural and spectral characteristics in the lipid bilayer were investigated, aiming at the role as donors for energy transfer to the voltage sensitive dye. Spectral sensitivity accompanied with the fluorescence resonance energy transfer was examined as functions of the transfer distance and the transient life-time of excited electrons.