**Link:** <https://solar-power-tech.com/e-posters/dsc_eposter_10/>

**Abstract**

The emergence of dye-sensitized solar cells (DSCs) as one of the potential new generation photovoltaic technology got widespread attraction due to its low cost, ease of fabrication, aesthetics and high performance in indoor/ambient light conditions. The photocurrent in DSCs can be correlated with light-harvesting capability of the dye, and the photovoltage (*V*oc) of the device is the difference between the Fermi level of the semiconductor and the redox potential of the electrolyte. Fermi level difference should be higher for attaining higher *V*oc, but the modification of the Fermi level in TiO2 is complex compared to manipulating the redox potential. The iodide/triiodide is extensively used as an electrolyte system in DSCs since 1990s, because of its fast regeneration kinetics, decreased rate of recombination of the injected electrons to the semiconductor with and the faster diffusion of ions helped to get superior performance.1 However, the redox potential of the conventional iodide/triiodide () electrolyte is 0.4 V vs *NHE* and it is fixed, which limits the *V*oc, thus diminishing its applications. The large driving force for regeneration and complicated two electron transfer process make the redox mechanism in DSCs with system as electrolyte unclear.2

Much research has been focused on incorporating alternative redox mediators in DSCs to overcome the limitations of iodide/triiodide electrolytes. Cobalt redox mediators got a lot of research interest because of the more positive redox potential, attained by proper tuning of the coordination sphere, and lesser absorption of the visible region in the solar spectrum. The record efficiency for the DSC was attained using a cobalt redox mediator with a power conversion efficiency of 14.3% for co-sensitized organic sensitizers.3 To realize efficient DSC and take these devices from ‘Lab to Fab’, a much better understanding of the charge transfer dynamics in various interfaces is highly essential. The forward electron processes (injection, regeneration, and diffusion) in DSCs are always in constant competition with the backward process (recombination).4 Detailed characterization tools have been developed successfully to probe the electron transfer dynamics at various interfaces in dye-sensitized solar cells. In this work, we focused more on the interfacial charge transfer dynamics of DSCs with three different cobalt bipyridine derivatives and Indolo[3,2-b]indole donor-based D–π–A dyes. The effect of bulky substituents in the recombination is investigated in detail.