Dynamics and distribution of photogenerated carriers in organic solar cells and in dye solar cells

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Based on large experience on DSC characterization by Impedance Spectroscopy (IS), we are now interested to provide detailed understanding of the factors determining the cell performance.[1] I discuss here the relation between recombination resistance and capacitance of the cell measured by IS, with the j-V curve both in the dark and under (1 sun) illumination. The most challenging aspect of the analysis is to separate the change of conduction band position from an array of charge transfer kinetics factors. This is not trivial since surface changes induced by the presence of the dye may affect both the beta parameter that modifies the fill factor, and slow the charge transfer kinetics, by surface blocking or other factors. We can provide a detailed energetic map that allows to explore innovations such as the new redox couple with more positive potential, or alternative nanostructure. Similar methods can be applied in quantum dot sensitized solar cell to speed up the progress oh these cells that is developing strongly in the last few years.[2]

In organic solar cells, it is important to obtain a picture of the carrier distribution, first in the dark, when the system is in equilibrium, and then at progressive illumination, and as a function of the potential.[3] We discuss our views on this which is obtained from measurement, specifically by scanning the capacitance over a broad set of conditions. This has been done in the standard PCM/P3HT configuration, some important informations about the carrier distribution can be obtained, and implications for open-circuit voltage are discussed.

References

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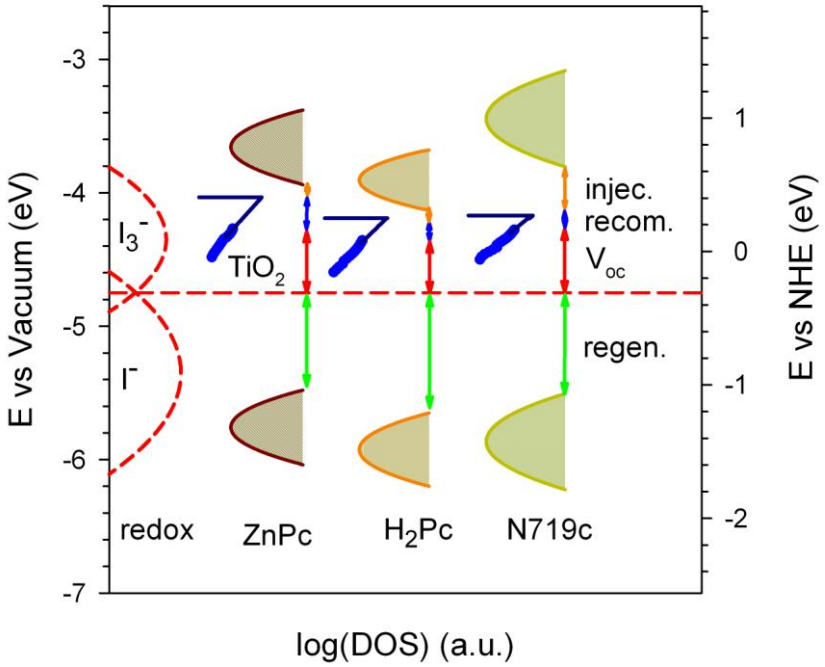

Energetocs of dye solar cells with different types of dyes.