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Directing the Assembly of Semiconductors for PV Applications[1]

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Segregated structures for photovoltaic devices are currently created by the use of lamination techniques or by the controlled multi-step layer deposition of the semiconductors by vacuum processing techniques. Both these techniques have their limitations. Most organic conjugated materials have low vapor pressure and are not easy to vacuum process. As a result, the deposition rate is not uniform, the thickness of the layers is also not uniform and the packing is not controlled. This results in very low charge mobility and in poor overall device efficiency. Moreover, while several studies have focused on that packing of pristine charge carrier conductors, no strategy exists for the controlling their packing when they are both present in a device. Therefore, there is an imminent need for strategies to assemble hole-conducting and electron-conducting π-conjugated organic moieties into segregated structures, with appropriate packing for charge mobility. Two questions that arise are (1) how do we obtain segregated structures of electron rich and electron poor semiconductors through self-assembly? and (2) within the segregate stacks, what packing is needed for high mobility of the charges? This talk will focus on our approaches using self-assembly to direct the packing of organic semiconductors for photovoltaic applications.

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