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Organic Photovoltaics at UCalgary: New Molecular Materials and Fully Printed Devices

Organic photovoltaics have been an active area of study since the late 1980s. The ability to convert light into electric energy in an affordable and versatile manner using such 'plastic' photovoltaics is very attractive. Researchers around the world continue to develop new materials, optimize devices, and understand operation which has resulted in ever increasing power conversion efficiencies. As chemists, developing new *photoactive* and *interlayer* organic materials that not only increase performance but can enable large scale manufacturing is still a challenging area. A recent goal has been to move away from fullerene base systems ([1]). In the pursuit of new materials to replace fullerenes, our research group has gravitated towards using classic dyes. This presentation will cover our work over the last four years at the University of Calgary in the design and practical synthesis of organic conjugated molecules based upon 'perylene diimides' ([2,3,4]) and the use as non-fullerene acceptors and electron transport layers in both spin-coated and slot-die organic photovoltaics ([5,6,7]). All slot-die coated large area devices with 10% power conversion efficiency will also be presented.

(1) Hou, Inganas, Friend, and Gao. Nature Materials, 2018, 17, 119-128

(2) Welch, Chemical Communications. 2018. 54, 11443-11446

(3) Welch, Chemical Communications. 2017. 53, 10169-10171

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(5) Welch, Journal of Materials Chemistry-C 2020, 8, 13430-13438

(6) Welch, ACS Appl. Mater. Interfaces 2019, 11, 49, 46017-46025

(7) Welch, ACS Appl. Mater. Interfaces 2019, 11, 42, 39010-39017

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