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ADVENT Technologies at the 12th International Symposium on Functional π-Electron Systems (Fπ-12). University of Washington, Seattle, USA. 19 – 25 July 2015.

Members of the MatHero project were participated at 12th International Symposium on Functional π-Electron Systems (Fπ-12) (http://depts.washington.edu/fpi12/) with an oral presentation entitled "**Slightly structural modification of BDT-quinoxaline copolymers towards high efficient organic photovoltaics**", a joint work between Fraunhofer Institute for Applied Polymer Research, ADVENT Technologies and Light Technology Institute, Karlsruhe Institute of Technology (KIT).

Benzodithiophenes (BDT) are interesting building blocks for absorber polymers in bulk-heterojunction (BHJ) organic photovoltaic cells. They are often used as donor units in donor-acceptor copolymers. So BDTs were combined with benzothiadiazoles, thieno[3,4-c]pyrrole-4,6-diones, 3-fluorothieno[3,2-*c*]thiophene-2-carboxylates or fluorinated quinoxalines. With these BDT-containing absorber polymers, power conversion efficiencies (PCEs) of 8 to 10 % were achieved in BHJs with various fullerenes.
In this conference, we will present recent advances on BDT-quinoxaline copolymers. Both the BDT and the quinoxaline basic structures were slightly modified by incorporation of several substituents at the BDT and by different fluorination degree and substitution pattern of the quinoxaline. The synthesis and purification pathway of the new absorber polymers will be described. The polymers were carefully characterized by cyclovoltammetry, PESA, GPC and UV-vis spectroscopy. The relations between chemical structure, their modification and energy levels will be discussed. The polymers were applied in BHJ organic solar cells employing an inverted device architecture. By carefully optimizing the polymer-fullerene blend ratio, selecting the optimum solvent and investigating different solvent additives such as 1,8-diiodooctane (DIO), the performance was optimized for each polymer individually. Substituting alkyloxy side chains at the BDT unit and the introduction of fluorine atomes at the quinoxaline unit enhances the V_{oc} of the photovoltaic device to 0.85V. The quinoxaline side chains induce the morphology of the blend and thereby rule the charge carrier transport. 8% power conversion efficiency was achieved with the most promising polymer. No solvent additive was needed for optimum results at active layer thicknesses ~ 200 nm, rendering this class of polymers perfect candidates to be incorporated into roll-to-roll deposition processes where thicker layers facilitate the layer deposition.

Advent Technologies is a world leader in the development of new materials and systems for energy applications. Advent Technologies is headquartered in Cambridge, MA, USA. The company also occupies research and development space in Patras, Greece where pilot manufacturing is taking place.

Advent Technologies Inc	One Mifflin Place, Suite 400, Cambridge, MA	T: +1 857 264 7035	
Advent Technologies SA	L. Kifissias 44, Marousi Athens, GR15125	T: +30 210 637 8820	F: +30 210 637 8888
Research Laboratories	Patras Science Park, Rio Patras GR 26504	T: +30 2610 911 583	F: +30 2610 911 585