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Dynamics in polymer-fullerene blends for photovoltaic applications, studied with quasielastic neutron scattering

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In organic photovoltaics, donor - acceptor bulk heterojunctions are often used as active layer due to their superior performance compared to e.g. planar structured devices. In this optically active polymer layer, photons are absorbed, excitons are created, subsequently dissipated at a material interface and hence free charges are provided. A promising low-bandgap electron donor material is the conjugated polymer PTB7 that is often used in combination with the fullerene derivate PCBM. Besides a large number of studies on structure and electrical properties, the level of knowledge about dynamics in this system is very limited. We investigated films of PTB7, pure PCBM, which acts as electron acceptor, and different blends of these two, prepared out of chlorobenzene solutions. Quasielastic neutron scattering experiments were done at the cold neutron time of flight spectrometer TOFTOF (MLZ, Garching) to determine hydrogen dynamics on a pico- to nanosecond timescale. In addition, two well established techniques for performance enhancement in organic photovoltaics, namely the addition of DIO to the casting solution and a methanol posttreatment of the active layer, are applied and their influence on the polymer dynamics is investigated.

Primary authors: Mr SCHWAIGER, Dominik M. (Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck-Str.1, 85748 Garching, Germany 2 Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany); Prof. MÜLLER-BUSCHBAUM , Peter (1 Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck--Str.1, 85748 Garching, Germany 2 Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany); Dr LOHSTROH, Wiebke (Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany)

Presenter: Mr SCHWAIGER, Dominik M. (Technische Universität München, Fakultät für Physik, Lehrstuhl für Funktionelle Materialien, James-Franck-Str.1, 85748 Garching, Germany 2 Heinz Maier-Leibnitz-Zentrum (MLZ), Technische Universität München, Lichtenbergstr. 1, 85748 Garching, Germany)

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