Unravelling the intricate interplay between donor and acceptor materials in bulk heterojunction blends for organic photovoltaics

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Over the last decade, the power conversion efficiencies of bulk heterojunction organic solar cells (OSCs) have increased steadily, demonstrating their great potential for future photovoltaic applications. Through recent advances in the synthesis of small molecule non-fullerene acceptors, the drawbacks of earlier fullerene-based OSCs have been circumvented. With rapid advances in material synthesis and device performance, the long-term stability of the OSCs has become the main remaining challenge towards commercialization. In this talk, it will be shown how a combination of advanced electron paramagnetic resonance (EPR) techniques and optical spectroscopy tools can give unique insight in the degradation mechanisms, involving both radical pathways and triplet exciton formation with the creation of reactive oxygen species. These results provide input for a rational design of new donor and acceptor materials.