“New fullerene materials in donor-acceptor photoactive layers expose bulk-heterojunction principles”

J.C. Hummelen

Stratingh Institute and Materials Science Center, University of Groningen, Nijenborgh 4, 9747 AG Groningen, The Netherlands. E-mail: j.c.hummelen@chem.rug.nl

Abstract:
Molecular donor-acceptor materials, especially blends of conjugated polymers and fullerene derivatives, can form bulk-heterojunctions. These can be used in, for example, photovoltaic, photodetecting, and scanning devices. Recently, a ‘plastic’solar cell with >2.5% power conversion efficiency under standard AM1.5 conditions has been reported. Many fundamental aspects of the bulk-heterojunction are yet to be unraveled, however. We now report on the synthesis and application several series of fullerene derivatives, that can form bulk-heterojunctions by themselves or in combination with other molecular donor components. In these series, we have varied, as much as possible, parameters like reduction potential, solubility, and compatibility, one at the time. From the action of the devices, new insights were obtained into how these devices function and on the electronic and morphological parameters that determine the efficiency.