

### Photomultiplication-type Photodiode with Nanowire-embedded Polymer Matrix

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Photomultiplication-type organic photodiode with a nanowire (NW)-embedded polymer matrix is suggested to achieve prolonged trap lifetime and enhanced major carrier mobility. Growth of well-defined NWs with low structural defects within poly(3-hexylthiophene-2,5-diyl):[6,6]-phenyl-C<sub>71</sub>-butyricacid-methylester(100:1 w/w) bulk-heterojunction (BHJ) active layer is achieved with cyclohexanone as a anti-solvent, which is analyzed by UV-Vis absorption spectroscopy, atomic force microscopy, transmission electron microscopy and grazing incidence X-ray diffraction analyses. Because of NW-embedding, remarkable increase of external quantum efficiency up to 250,000%, responsivity up to 1,300 A W<sup>-1</sup> and high specific detectivity up to 6.3×10<sup>13</sup> Jones can be realized by embedding an optimal amount of NW into conventional PM-OPD structured as ITO/PEDOT:PSS/BHJ/Al.