

Thin Film Red-selective Organic Photodiode with Enhanced Space Charge Carriers

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Today, Imagesensor applied for a lot of fields such as autonomous vehicle, robot and industry. But there is a problem that should be solved. Mostly organic photodiode concentration upon blue and green selective photodiode. So, We suggest a synthetic strategy to achieve thin film red-selective photodiode, which is the most important requirement for commercializing organic photodiode. A new conjugated polymer is synthesized by difluorobenzothiadizole with a difluorinated donor moiety. A organic photodiode with a structure of ITO/ZnO/Active layer(BHI, 550nm)/MoO₃/Ag exhibits a high detectivity of $\sim 6 \times 10^{12}$ jones at 650 nm with a low noise equivalent power as well as full width at half-maximum. Our study clarify the origin of the thin-film color-selectivity to weakened intramolecular charge transfer between the donor and acceptor as confirmed by grazing-incidence X-ray diffraction. As a results, a substantial number of photogenerated charges can remain as space charge carriers. This research shows the capability of realization of red color selectivity of a polymer photodiode even at a thin film thickness.