

Fabrication Of Ultra Thin Photodiode Via Photomultiplication By Using An Efficient 2D Planar Structural And Nonfullerene Based Small Molecular Semiconductor As An Optical Sensitizer

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Due to the low absorption coefficient of Si, Conventional Si based photodiodes usually require a thicker active layer in the scale of micrometer range for better operation, which in turn limits the resolution of Si-based complementary metal-oxide-semiconductor image sensors (Si-CMOS). Later Panasonic developed Organic Photodiodes (OPD) as a replacement for Si CMOS image sensor, which requires 500 nm of active layer thickness for better performance. Recently Zhang et al. introduced Photomultiplication based OPDs, where he used PCBM as trapping sites aka optical sensitizer to achieve thinner active layer of 150 nm. Since then, PCBM based photodiode became conventional OPD due to its thinner active layer and higher external quantum efficiency (EQE) over 10^{12} Jones. In this experiment, we further reduced the active layer thickness of OPD to 70nm by introducing non-fullerene based small molecular semiconductor called IDIC as optical sensitizer, instead of regular conventional fullerene based semiconductor.