

## A *m*-Terphenyl Umbrella for Fused Porphyrin Dyes toward High-Performance Dye-Sensitized Solar Cells

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Porphyrin dyes with  $\pi$ -extended structures, particularly those with aromatic fused designs, have garnered considerable attention as efficient sensitizers for dye-sensitized solar cells (DSSCs) because of their effectively  $\pi$ -extended nature and resultant excellent light-harvesting ability. However, their photovoltaic performance is often limited by high aggregation tendencies caused by strong  $\pi$ - $\pi$  interactions and charge recombination processes. Since *m*-terphenyls can serve as effective steric protecting groups, incorporating umbrella-shaped *m*-terphenyls on top of porphyrin dyes could unlock the full potential of highly  $\pi$ -extended porphyrin dyes. In this study, we designed and synthesized new fused porphyrin dyes with a *m*-terphenyl group: **T-Ph**, **T-*t*BuPh**, **TT-Ph**, and **TT-*t*BuPh**. Under optimized conditions, DSSCs with **T-Ph** and **T-*t*BuPh** achieved a remarkable power conversion efficiency (PCE) of 11.5%, surpassing those with reference porphyrin dyes, **GY50** with a V-shaped diarylamino group, and **DfZnP** without a *m*-terphenyl group. More importantly, the co-sensitized DSSC using **T-*t*BuPh** and a complementary dye **XY1B** afforded the highest PCE of 12.3% ever reported for DSSCs with fused porphyrin dyes. The *m*-terphenyl umbrella effectively blocks dye aggregation on TiO<sub>2</sub> and charge recombination against redox shuttles, enhancing the photovoltaic performance of DSSCs with fused porphyrin dyes.

