

## End-Group Alkylation of Diarylethene to Enhance Photo-Switchability of Organic Transistors

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A strategic molecular approach to maximize the switching behavior of diarylethene (DAE)-based organic transistors is introduced. By tuning the length of alkyl side chains of the biphenyl unit attached to 1,2-bis(5-biphenyl-2-methylthien-3-yl)perfluorocyclopentene (DAE), we show that the molecular environment for reversible photoisomerization of DAEs can be optimized. Four different DAEs are synthesized and ITIC is chosen to construct a semiconductor matrix to maximize the quantum yield of photoconversion considering the complementary absorption range of both materials. The improved molecular compatibility of DAEs with ITIC makes the overall bulk heterojunction film amorphous, allowing more free volume for reversible photoisomerization. DAE\_C6 shows the maximum quantum yield for both photocyclization and photocycloreversion, enabling high light-controlled on/off ratios in photoswitchable transistors. Furthermore, the exceptionally high DAE\_C6 quantum yield enables robust fatigue resistance under repeated photoswitching with only a 30% decrease in the on/off ratio after 100 cycles.