

# Effects of thermal-annealing and processing-additive treatment on crystallization-induced phase separation in organic solar cells utilizing octapentyl tetrabenzotriazaporphyrins

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**はじめに** : Although effects of thermal-annealing and processing-additive treatment on the crystallization-induced phase separation and the photovoltaic performance of bulk heterojunction (BHJ) organic solar cells (OSCs) have been extensively discussed, the comparison between them in one BHJ system is still limited [1,2]. Herein, we report the effects of thermal-annealing and processing-additive treatment on crystallization-induced phase separation and photovoltaic performance in BHJ OSCs utilizing non-peripherally substituted octapentyl tetrabenzotriazaporphyrins (C5BTAPH<sub>2</sub>) (Fig. 1) mixed in 1-(3-methoxycarbonyl)propyl-1-phenyl-(6,6)C71 ([70]PCBM).

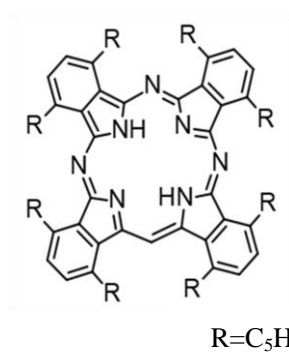


Fig. 1: Molecular structure of C5BTAPH<sub>2</sub>.

**実験** : MoO<sub>x</sub> films were thermally evaporated onto ITO substrates. A solution containing a mixture of C5BTAPH<sub>2</sub>: [70]PCBM (3:2) in chloroform with an addition of various amount of 1,8-diiodooctane (DIO) was spin-cast onto a MoO<sub>x</sub> layer. Finally, aluminum layer was deposited through a shadow mask by thermal evaporation. The thermal-annealing treatment was carried out under N<sub>2</sub>.

**結果** : As shown in Fig. 2, although the crystallinity of C5BTAPH<sub>2</sub> in the BHJ thin films were improved using either thermal-annealing or processing-additive treatment, the optimum PCEs (1.4%) of the thermal-annealing treated devices was markedly lower than PCEs (4.2%) of the processing-additive treated devices [3]. These results furthermore were discussed by taking the thermal properties and molecular aggregation of [70]PCBM into consideration.

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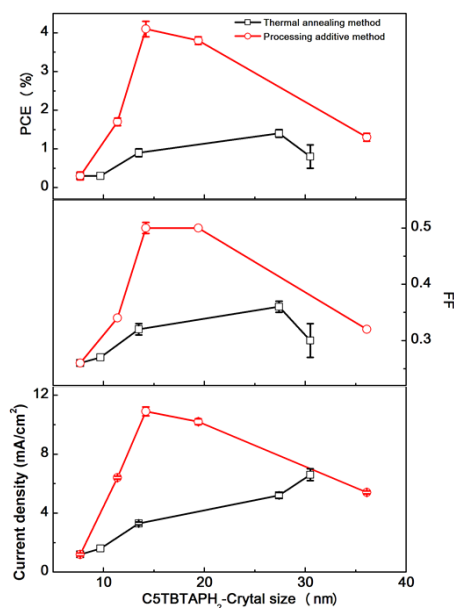


Fig. 2: Dependence of photovoltaic performance of C5BTAPH<sub>2</sub>: [70]PCBM BHJ OSCs on C5BTAPH<sub>2</sub> crystallite size.