光縮環反応を用いた拡張ペリレンジイミド不溶性薄膜の作製と評価

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Fabrication and Characterization of Expanded Perylene Diimide Derivatives Insoluble Thin Films by Photo-Induced Scholl Reactions (*Faculty of Science and Engineering*, *Iwate University*) ○Yamato Manjome, Tomoya Ogawa, Daiki Kuzuhara

Precursor methods have been developed for device fabrications in solution processes. In this study, we focused on perylene diimide (PDI) with aromatic substitutions at 1,7-positions, which can be converted to coronene diimide (CDI) derivatives by photo-induced cyclization reaction (Fig. 1). As a result of photo-induced cyclization reaction, the solubility of PDI derivatives was drastically decreased because of the expansion of the π-conjugations. We used the changes of solubility of PDI derivatives to fabricate multi-layer thin-films by the solution process.

Upon photoirradiation of a chlorobenzene solution of PDI derivatives, the UV-visible absorption spectrum gradually changed, indicating that the photo-induced cyclization reaction proceeded (Fig. 2). Furthermore, the photo-induced cyclization reaction proceeded in thin films as well. In this presentation, we will report the effects of substituents on PDI and heavy atom effects on the photo-induced cyclization reaction.

Keyword: Perylene Diimide; photo-induced cyclization reaction; multi-layer structure; precursor method; organic semiconductor

溶液プロセスにおけるデバイス作製のため、これまでに前駆体法が開発されてきた[1]。本研究では、1, 7 位に芳香族を置換したペリレンジイミド(PDI) に注目し (Fig. 1)、光縮環反応による PDI 誘導体の溶解度制御および溶液プロセスによる PDI 誘導体積層膜の作製を試みた。

PDI 誘導体 **1** のクロロベンゼン溶液に光照射すると、紫外可視吸収スペクトルが徐々に変化し、光縮環反応が進行してコロネンジイミド誘導体 **2** が生成した(Fig. 2)。さらに薄膜においてもこの光縮環反応が進行した。本発表では、PDI 上の置換基や重原子効果が光縮環反応に与える影響についても併せて報告する。

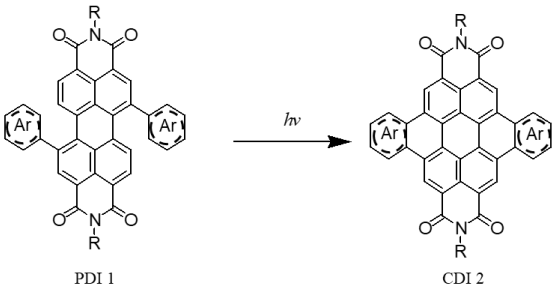

Fig.1 Photo-induced cyclization reaction from PDI 1 to CDI 2

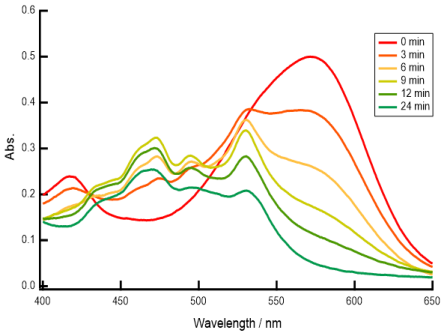

Fig.2 Changes in UV-vis absorption during the conversion of PDI 1 to CDI 2 under photoirradiation

[1] T. Motoyama, T. Kiyota, H. Yamada, K. Nakayama, *Sol. Energy Mater. Sol. Cells* **2013**, *114*, 156.

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