

## ドナー・アクセプター型分子の多孔性シリカへの光誘起吸着と光物性変化

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Modulation of photophysical properties of donor-acceptor molecules caused by photo-induced encapsulation within mesoporous silica (<sup>1</sup>Graduate School of Science, Kyushu Univ., <sup>2</sup>Center for Organic Photonics and Electronics Research, Kyushu Univ.) ○Tetsu Tamura,<sup>1</sup> Raj Kumar Koninti,<sup>1</sup> Kiyoshi Miyata,<sup>1</sup> Youichi Tsuchiya,<sup>2</sup> Chihaya Adachi,<sup>2</sup> Ken Onda<sup>1</sup>

Phenothiazine-triphenyltriazine (PTZ-TRZ) is a prototypical donor-acceptor-type molecule in which PTZ and TRZ act as electron donor and acceptor upon photoexcitation, respectively. We discovered that the photoexcitation facilitates encapsulation of PTZ-TRZ in a cavity of mesoporous silica and this photo-induced encapsulation (PIE) modulates the photophysical properties of PTZ-TRZ.

The PIE is attributed to change in charge distribution of PTZ-TRZ upon photoexcitation. The charge transfer character in the excited state promotes the migration of the molecules in cavities possessing high polarity. The encapsulation suppresses the molecular vibrations due to the molecular-size cavities, and this suppression makes the photoluminescence quantum yield higher and the emission lifetime longer.

**Keywords :** Photoluminescence; Thermally activated delayed fluorescence; Photo-induced encapsulation; Time-resolved spectroscopy; Electronic excited state

フェノチアジントリアジン(PTZ-TRZ, Fig. 1a)は電子ドナー部位(PTZ)とアクセプター部位(TRZ)で構成される。今回、PTZ-TRZ と多孔性シリカ系を光励起すると多孔性シリカの細孔内部への吸着速度が上がり、発光特性が変化することを見出した。

この光誘起吸着には、励起状態での PTZ-TRZ の電子分布が関係している。PTZ-TRZ は、電子励起状態で電荷移動性の電子配置を取るため、双極子モーメントが大きくなり、極性の高い多孔性シリカの細孔内部に移動しやすくなる(Fig. 1b)。光誘起吸着が起こると、細孔内の狭小空間によって分子振動が抑制され、PTZ-TRZ の発光量子収率の向上と発光寿命の長寿命化が観測された(Fig. 1c)。

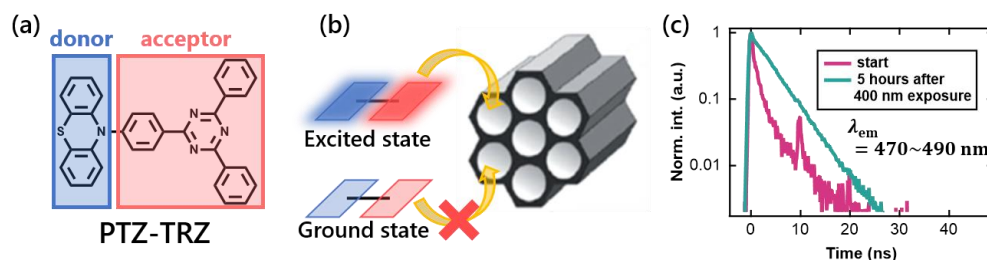


Figure 1. (a) Molecular structure of PTZ-TRZ, (b) PIE scheme of PTZ-TRZ within mesoporous silica, (c) decay profiles before and after 400 nm pulse irradiation to a 0.59 mM THF solution of PTZ-TRZ in the presence of mesoporous silica, MCM-41.