# Supramolecular Miktoarm Star Copolymer with a Zinc Phthalocyanine Core for Organic Transistor Memory

([1]*Graduate School of Pure and Applied Science, University of Tsukuba*, [2]*National Institute for Materials Science*) ○Xinhao Zhong,[1,2] Junko Aimi,[2] Masayuki Takeuchi[1,2]

**Keywords**: Miktoarm star copolymer; Organic transistor memory; Supramolecular; Thin film morphology

Non-volatile organic field-effect transistor (OFET) memory is an emerging and promising technology for possible use in wearable data storage since it has a non-destructive read-out memory cell system with multi-bit storage and an easily integrated structure. OFET memory possesses a memory layer between the organic semiconductors and the control gates, which can store and release charges during the writing and erasing processes. Various materials, including ferroelectric material, polymer electrets, and nano floating gates have been demonstrated to show memory characteristics in OFET device structures. We recently demonstrated non-volatile OFET memory that utilizes a star-shaped polymer with a metallo phthalocyanine (MPc) core as the memory layer. The star polymer has distinct charge trapping sites in the MPc core surrounded by dielectric polystyrene arms, enabling to store and release hole charges like nano floating gates, resulting in high performance memory characteristics.[1]

Here we prepared a new memory material, supramolecular miktoarm star copolymer with a zinc phthalocyanine core (ZnPc), which is constructed by metal-ligand coordination between ZnPc-cored star polystyrene (ZnSP) and poly(methyl methacrylate) with a pyridyl end-group (pyCTA-PMMA) as shown in Figure 1.[2] The OFET memory with the supramolecular miktoarm star copolymer as memory layer was fabricated using 2,7-dioctyl[1]benzothieno[3,2-b][1]benzothiophene (C8-BTBT) as p-type organic semiconductor. The device performance as well as the influence of the polymer morphology on memory characteristics will be discussed.

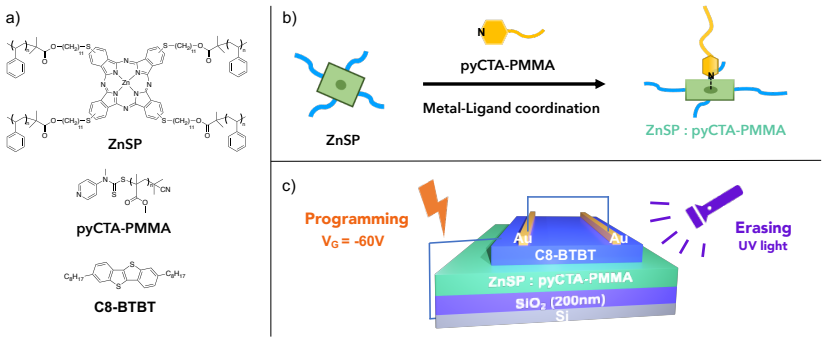


Figure 1. a) Chemical structure of ZnSP, pyCTA-PMMA and C8-BTBT. b) Formation of supramolecular miktoarm star copolymer with ZnSP and pyCTA-PMMA. c) Schematic configuration of the OFET memory device.

[1] a) J. Aimi, C. T. Lo, H. C. Wu, C. F. Huang, T. Nakanishi, M. Takeuchi W. C. Chen, *Adv. Electron. Mater.* **2016**, 2, 1500300. b) J. Aimi, P. H. Wang, C. C. Shih, C. F. Huang, T. Nakanishi, M. Takeuchi, H. Y. Hsueh and W. C. Chen, *J. Mater. Chem. C*, **2018**, 6, 2724-2732. [2] X. Zhong, A. Nagai, M. Takeuchi, J. Aimi, *Macromol Rapid Commun*, **2022**, 2200666.

© The Chemical Society of Japan 