Institut Charles SADRON
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Séminaire

Jeudi 5 juin 2025 à 10h30

Amphithéâtre Henri Benoît

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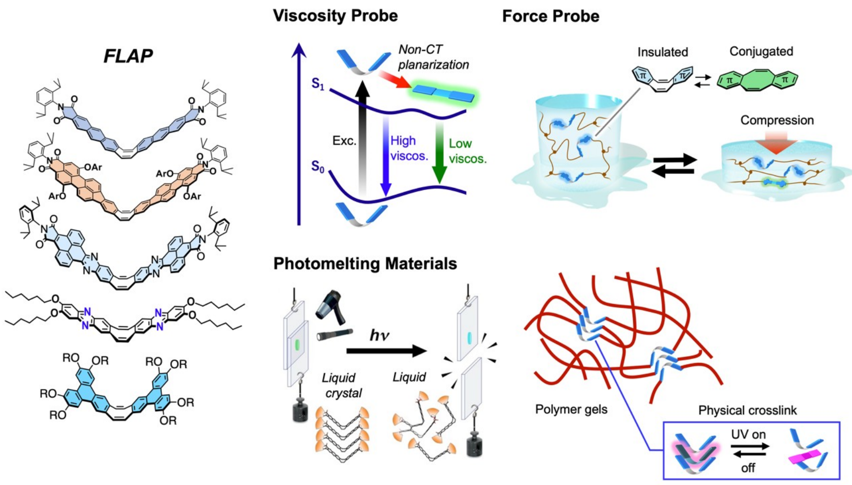
Flapping Molecules for Force Imaging and Photomelting Materials

Flexible and aromatic photofunctional system (FLAP) has been developed based on the design of flapping molecules, in which a central flexible ring is fused with multiple rigid wings.

A series of FLAPs demonstrated diverse functions as below.

1) Viscosity probe: A molecular flapping motion feels nanoscale viscosity more sensitively than a conventional twisting motion. Dynamics of single free volume in polymeric materials can be also monitored by the flapping motion.

2) Force probe: Dual emissive force probes explore quantitative mechano science. The ratiometric fluorescence analysis monitors both mechanical polymer chain stretching and strain-induced crystallization (SIC) of polymers by hyperspectral imaging.



3) Photomelting materials: Twofold π-stacking of V-shaped molecules exhibits high cohesive force of materials, while excited-state planarization plays a key role for photoinduced melting. The control of assembly develops light-melt adhesives and photomelting gels on demand.

References for FLAP: [1] Excited-state planarization, Twofold columnar π-stacking: *J. Am. Chem. Soc.* **2013**, *135*, 8842; *Chem. Eur. J.* **2014**, *20*, 2193; [2] Light-melt adhesive: *Nat. Commun.* **2016**, *7*, 12094 (2016); [3] Ratiometric viscosity probe: *J. Mater. Chem. C* **2017**, *5*, 5248; [4] Molecular movie for a photoresponsive liquid crystal: *J. Am. Chem. Soc.* **2017**, *139*, 15792; [5] Singlet fission: *Angew. Chem. Int. Ed.* **2018**, *57*, 5438; [6] Mechanophore function in crystals: *J. Am. Chem. Soc.* **2018**, *140*, 6245; [7] Fluorogenic viscosity probe: *Angew. Chem. Int. Ed.* **2020**, *59*, 16430; *Bull. Chem. Soc. Jpn.* **2020**, *93*, 1102; [8] Excited-state aromaticity: *J. Am. Chem. Soc.* **2020**, *142*, 14985; [9] Single free volume monitoring: *J. Am. Chem. Soc.* **2021**, *143*, 14306; [10] Force probe for polymer physics: *Nat. Commun.* **2022**, *13*, 303; *J. Am. Chem. Soc.* **2023**, *145*, 26799; [11] Real-time stress imaging of compressed gels: *J. Am. Chem. Soc.* **2022**, *144*, 2804. [12] Probing strain-induced crystallization: *J. Am. Chem. Soc.* **2023**, *145*, 26799. [13] Ultrafast planarization by Baird aromaticity: *J. Am. Chem. Soc.* **2025**, *147*, 12051.

Les personnes souhaitant rencontrer S. Saito sont priées de prendre contact avec Nicolas Giuseppone.

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Flapping Molecules for Force Imaging and Photomelting Materials

Curriculum Vitae

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Education and Academic Career: SAITO Shohei is a professor of functional molecules and materials in Osaka University. He completed his PhD on the studies of expanded porphyrins and Möbius aromaticity under the tutelage of Atsuhiro Osuka in Kyoto University. After his studies on boron doped nanographenes in the group of Shigehiro Yamaguchi at Nagoya University, Japan, he had been an associate professor in Kyoto University during 2016-2024. In 2024, he moved to Osaka University as a current position. His research interest focuses on synthetic molecules and materials that create dynamic and responsive functions based on conformational flexibility.

Awards:
2022 Nozoe Memorial Award for Young Organic Chemists (from JPOC)

2018 The Asian and Oceanian Photochemistry Association (APA) Prize for Young Scientist

2016 Japanese Photochemistry Association (JPA) Prize for Young Scientist

2015 Chemical Society of Japan (CSJ) Award for Young Chemists

2014 Japanese Science Ministry (MEXT) Award for Young Scientists

Research Interests: Photo- and Mechanoresponsive Molecules and Materials

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