応力緩和の定量的評価を目指した主鎖導入型蛍光 Force Probe の開発

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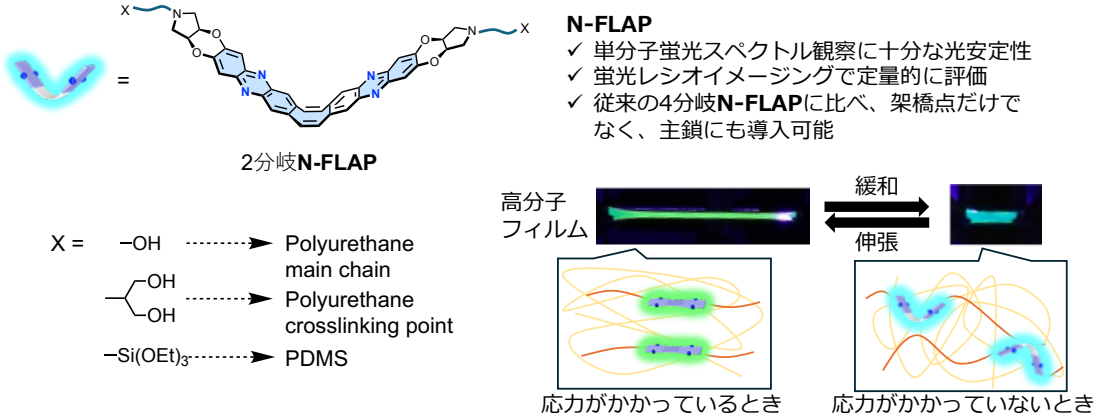
Development of Dual-Emissive Fluorescent Force Probes for Quantitative Evaluation of Stress Relaxation in Polymeric Materials ([1]*Graduate School of Science, The University of Osaka*) Aya Shirai,[1] Kensuke Suga,[1] Shohei Saito[1]

Dual-emissive fluorescent force probes, which reversibly change their fluorescence band in response to mechanical stress, enable quantitative visualization of the spatial nanoscale stress distribution in polymeric materials. However, methods of quantitative evaluation of nanoscale stress relaxation at the molecular level in stretched soft materials, including its spatial distribution, remain limited. We previously reported a tetra-substituted **N-FLAP**, which works as a fluorescent force probe with sufficient photostability for single-molecule spectroscopy. However, due to its tetra-substituted structure, incorporation into main chains of polymer network was difficult. In this study, we investigated the synthesis of a photostable **N-FLAP** that has two polymerizable substituents, which can be introduced into the polymer main chain to observe the stress relaxation and variations in the behavior of individual molecules.
Keywords: Soft Materials; Dual Fluorescence; Fluorescent Force Probe; Stress Relaxation; Single-Molecule Fluorescence Spectroscopy

応力に応答して二種類の蛍光状態を可逆的に変化させる蛍光 Force Probe は、高分子材料内のナノ応力集中の空間分布を定量的に可視化できる。[1] しかしながら、ソフトマテリアルのナノスケールの応力緩和過程を、空間分布も含めて定量評価する手法は、依然として限られる。我々が開発した従来の **N-FLAP** は置換箇所が４つある蛍光 Force Probe として機能し、単分子蛍光スペクトル観察に十分な光安定性を示す。[2] しかし４分岐であるがゆえに高分子網目の主鎖へ導入することが難しかった。今回、高分子網目の主鎖に導入できる **N-FLAP** を開発し、応力緩和や分子ごとの挙動のバラつきを追跡するために２分岐型の光安定な **N-FLAP** の合成を検討した。



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