

光誘起結晶移動を利用したナノ・マイクロ材料運搬

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Mass transport of nano/micro materials driven by photo-induced crawling motion of crystals (¹AIST, ²Graduate School of Science and Technology, University of Tsukuba) ○Koichiro Saito,¹ Yasuo Norikane^{1,2}

Crystals of azobenzene derivatives that show crawling motion on a glass substrate by light irradiation have been reported.¹ In the case of 4-(methylamino)azobenzene (4-MAAB), when the crystals are irradiated with blue visible light from the back side of the glass substrate, the crystals move away from the light source.² Since the crawling direction can be controlled according to the irradiation direction, it is expected to be applied to the mass transportation method that does not require a flow channel. However, there have been no reports that demonstrate the transportation of nano/micro materials. In this study, we succeeded in transporting fluorescent nanoparticles or microparticles on a glass substrate by mixing them with 4-MAAB crystals. It was also found that the change in the brightness of the fluorescence was repeated during the transportation process. This result suggests that the fluorescent nanoparticles are flowing along with the crystal movement.

Keywords : Azobenzene; Organic crystal; Photoisomerization; Solid-to-liquid phase transition

光照射によってガラス基板上を移動するアゾベンゼン誘導体の結晶が報告されている¹⁾。4-メチルアミノアゾベンゼン(4-MAAB)の場合、ガラス基板裏側から青色の可視光を結晶に照射すると、結晶が光源から遠ざかる方向に移動する²⁾。光の照射方向に応じて移動方向を変化させられるため、流路を必要としない微量物質運搬技術への応用が期待される。一方で、実際にナノ・マイクロ材料を運搬した例は報告されていない。本研究では、蛍光性のナノ粒子またはマイクロ粒子を 4-MAAB の結晶と混合し、ガラス基板上での運搬を達成した。また、運搬の過程で蛍光の明暗が繰り返されることを見出した。結晶移動によって蛍光性ナノ粒子が流動していることが示唆され、移動機構の解明につながる知見が得られた。

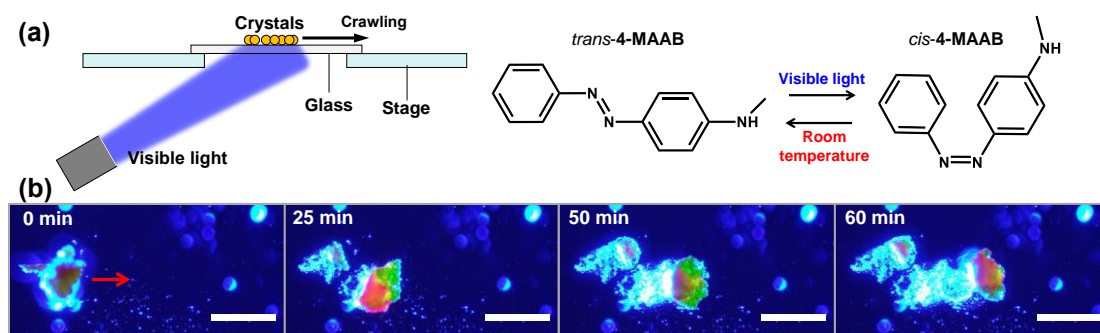


Figure 1. (a) Schematic diagram of the experimental setup. (b) Microscopy images of 4-MAAB crystals that transport red fluorescent nanoparticles. Scale bar: 200 μm.

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