

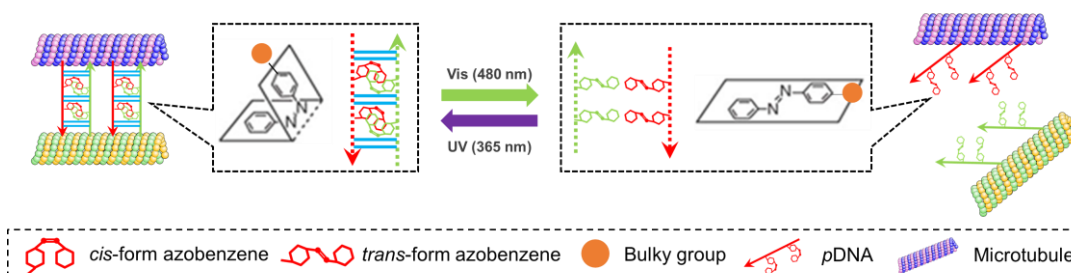
Photocontrol of the Swarming of Vis-ON and Vis-OFF Switched Biomolecular Motor Based-Microrobots

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Swarming is a typical example of collective behaviour often observed in nature as ant colonies, fish schools, and bird flocks, which formed purely by a local interaction among the nearest neighbours in a decentralised way.¹ Motivated by such a swarm behaviour, the research on artificial swarm robots has absorbed a great attention of many researchers in the field of robotics. In our group, micro sized molecular swarm robot controlled by photosensor and DNA was developed on the bases of self-propelled biomolecular motor system (microtubule (MT)-kinesin) (Vis-ON switched system).²

In this work, we have attempted to achieve a completely reversible regulation of the swarm robots to the previously reported system by substituting a bulky group to the *para*-position of azobenzene (Vis-OFF switched system). We incorporated the azobenzene to the DNA (*p*DNA) and employed to modify MTs where, azobenzene acts as photosensor. *p*DNA and its complimentary DNA modified MTs were prepared by conjugating respectable DNA to MTs through a copper free click reaction. Swarming of *p*DNA modified MTs was then performed in the presence of adenosine triphosphate (ATP) on a kinesin coated glass surface under UV light irradiation. Additionally, the role of relevant physicochemical parameters such as time, concentration of *p*DNA, and the intensity of the UV light was investigated to observe the swarming in a reversible and efficient manner. Combination of Vis-ON and Vis-OFF switched system will advance the development of highly programmed molecular robot system with expanded ability.



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