Poster Presentation

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Polymerization induced photomechanical bending in single crystals

Ranita Samanta[1], Subhrokoli Ghosh[2], C Malla Reddy[1]
[1]*Department Of Chemical Sciences,IISER Kolkata, Mohanpur Campus, Nadia, India,* [2]*Department of Physical Sciences Indian Institute of Science Education and Research (IISER) Kolkata Mohanpur Campus, Nadia, India*
E-mail: samantaranita@gmail.com

Constructing smart mini-actuator devices with high efficiency and low cost using renewable energy are vital for future applications in various fields. In this context, molecular actuators that convert external energy into mechanical work using visible light are more attractive than UV light due to the obvious reasons. In recent years the research on conversion of light into mechanical form by photomechanical bending attracted great attention. Photoreaction in highly ordered molecular crystals such as cis-trans isomerisation, electrocyclic reaction, photodimerization have been widely investigated as these reactions are generally accompanied by molecular scale motions, which lead to macroscale movement of the crystals. Here, we report photomechanical bending based on an interesting example of 1,1'-dioxo-1H-2,2'-biindene-3,3'-diyl didodecanoate derivative by visible light mediated polymerization reaction, leading to photomechanical bending. The initial polymerization reaction starts from the surface and results in anisotropic contraction of (001) plane. From the crystallographic data, it is clear that the unit cell length along a-axis is elongated (from 20.4473 Å to 20.909 Å) and along b and c axes contract (b = 4.9455(3) Å to 4.8571 Å ; c = 19.5958 Å to 19.210 Å) after irradiation. The stress generated due to the difference in the degree of contraction leads to the bending of the crystal towards light. To observe the deformity of the single crystal clearly, we mounted the needle shaped crystal of nearly 4 cm in length on a glass tip and irradiated it on (001) face with 450 nm laser for about 52 seconds. The crystal undergoes bending smoothly towards the light source nearly 40º perpendicular to its longest dimension (b axis), without breaking.

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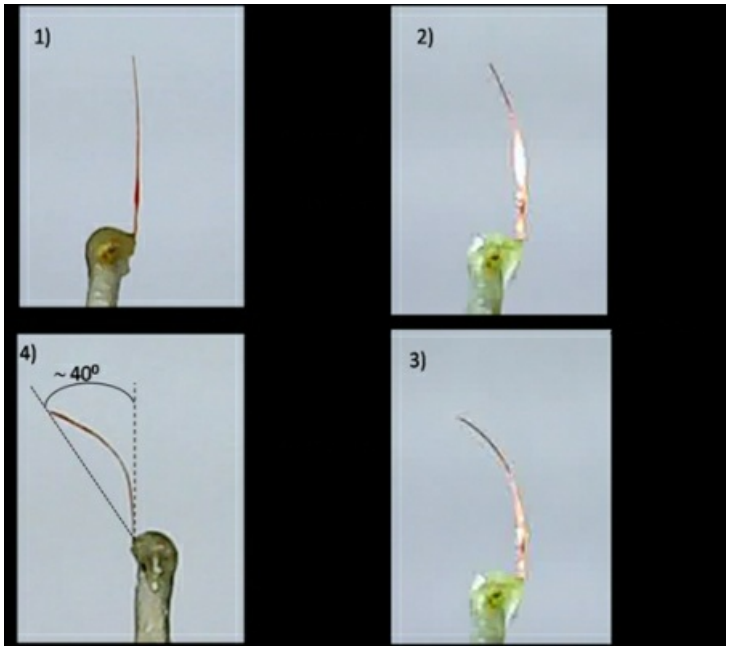

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