

Photomechanical motions in organoboron crystals featuring topochemical reactivity and phosphorescence emission

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Molecular single crystals which respond to different external stimuli (heat, light, magnetic field, mechanical force etc.), have promising applications in the development of next-generation smart materials. [1, 2] Recently, the transduction of thermal/light energy into various macroscopic mechanical motions (such as bending, splitting, and popping/jumping effects) in molecular single crystals has emerged at the forefront of research. Among various stimuli, light is the most preferable in terms of remotely controllable actuation. [3] In particular, the rapid transformation of light energy (photon) into mechanical motions in densely packed metal-free luminescent crystals offers a sustainable choice of *smart ordered materials* for lightweight actuating and all-organic photonic devices. [4] However, the integration of rapid photodynamic motions and room temperature phosphorescence (RTP) emission in molecular crystalline materials is seldom known.

Here, I present a new class of molecular organoboron-based Lewis acid-base type crystals, which exhibit prompt photodynamic effects (ballistic splitting, moving, and jumping motions or *photosalient effect*) under ultraviolet (UV) to green-energy visible light/solar energy (Fig. 1). [5-7] Moreover, the mechanical motions (second scale) in such photoresponsive materials are associated with topochemical [2+2] cycloaddition reactions in the *single-crystal-to-single-crystal* (SCSC) fashion. Remarkably, these organoboron crystals also display dynamic RTP features as their emission peaks/intensities promptly change due to photomechanical effects and SCSC reactions. These results disclose the potential of dynamic organoboron crystals to be exploited as *energy-transforming* and *phosphorescent smart materials*.

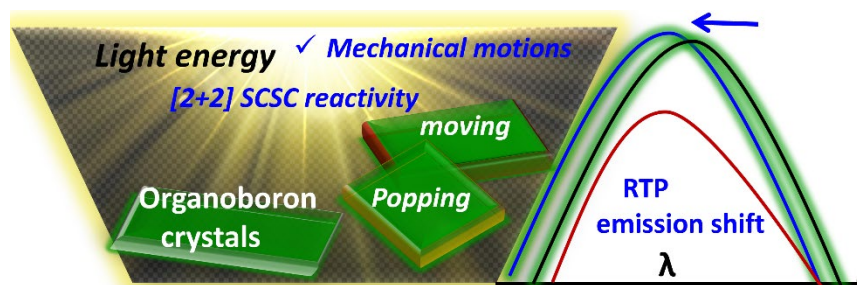


Figure 1. Different photomechanical motions in organoboron single crystals in response to UV or visible light source.

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