Photomechanical effect and photochemical reaction kinetics in organic molecular crystals

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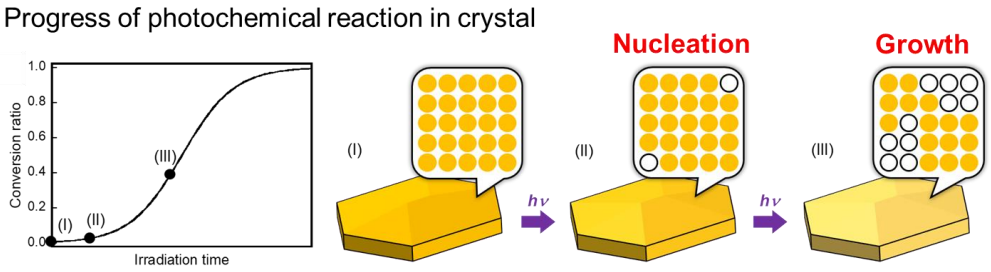
Photomechanical materials that directly convert light energy to mechanical energy have been attracting much attention for application to photoactuators.[1] Liquid crystalline polymers and molecular crystals incorporating photoresponsive molecules are known as typical photomechanical materials. Especially, molecular crystals have shown superior actuator performance such as fast response speeds, high energy densities, and photon-to-work conversion efficiencies.[2-4] Therefore, photomechanical molecular crystals are promising candidates for future actuators used in the real world.

Photomechanical molecular crystals can exhibit a various light induced motions (bending, twisting, coiling, peeling, and hopping) that are driven by a wide range of photochemical reactions, including cis-trans isomerizations, ring opening closing isomerizations, linkage isomerizations, and [2+2] and [4+4] photodimerizations.[5] In most cases, their photomechanical responses have been interpreted by a static method using the unit cell dimension changes revealed by X-ray crystallographic analyses for crystals before and after photochemical reactions. Therefore, it has been difficult to elucidate the dynamic nature of photomechanical responses. In this paper, we introduce our recent research on photomechanical molecular crystals, focusing on the kinetics of photochemical reactions within the crystal.[6-8]



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