Drastic changes in the mechanical properties of long alkyl-chained organic crystals depending on recrystallizing solvent

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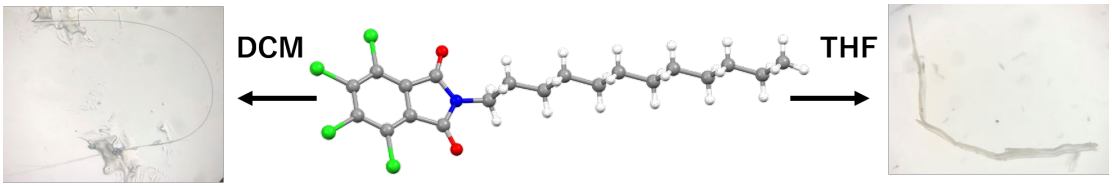
Organic and inorganic crystals can cause reversible (elasticity) or irreversible deformation (plasticity) by external stimuli such as mechanical force, pressure, heat, etc.[1], and molecular crystals responding to them have recently attracted much attention[2] in the area of crystal engineering, supramolecular chemistry and material science with applications in artificial muscles, pharmaceuticals, mechanosensors, smart materials, actuators, etc. However, since most crystals display hard properties because of their dense and highly ordered arrangement and are able to be brittle and crack by mechanical stresses, as well as irreversibly deformed after being damaged, they are curbed in their applicability as materials for flexible devices.

The choice of solvent and/or evaporation rate for single crystal growth by evaporation technique may influence on a factor such as the introduction of solvent molecules in the crystal lattice, the formation of polymorphs, or the change of crystal face, as well as the production of "elastic and brittle"[3] or "plastic and brittle"[4] crystals, and thus a suitable solvent may be an important factor for the preparation of flexibly bendable crystals. Different crystallizations of the same compound to "elastic" or "plastic bending" are very rare, and according to our knowledge, coumarin is the only organic crystal that reveals such behaviour. The variations into such deformations depending on recrystallization solvents is still an unexplored area, and we firstly report in detail the formation of solvent-dependent crystals and their mechanical properties as well as their characterizations.



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