

Converting Thermally Innocent to Thermally Responsive Solids

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Mechanical response in ordered molecular solids in response to external stimuli is intensely investigated in recent times owing to their various potential practical uses, such as for designing mechanical sensors, probes for smart medical devices, artificial muscles. Single crystals are preferred over polymers as the dense and ordered packing in former facilitate the rapid and more efficient mechanical response. In this context such actuating single crystals, with inherent high sensitivity to external stimulus, can be remarkably useful. Thermosalient (TS) effect is typically due to phase transitions caused either by changes in molecular conformation and/or slight variation in crystal packing. As designing of phase transitions currently remains elusive, the design of thermosalient behaviour has also remained a formidable challenge. Here using co-crystallization approach we have successfully synthesized a series of thermosalient co-crystals, by employing thermally active co-formers for co-crystallizing with other thermally innocent co-formers. Further, we also achieved TS salts, where a single component parent compound acts as the TS template in the salt with a non thermo-responsive co-former. We characterized these crystals by using SCXRD, DSC, Hirshfield analysis, and video analysis. This approach can potentially allow generation of a library of multicomponent TS forms, for instance to tune the response time, temperature, as well as to impart an additional functionality inheriting from the co-former.

References:

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