Multifunctional Hybrid Materials for Energy Conversion in Photovoltaics

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Hybrid organic-inorganic materials are increasingly relevant for emerging energy technologies.[1] In particular, metal halide perovskites have become one of the leading semiconductors for solar-toelectric energy conversion in photovoltaics.[2–3] However, their operational instability hinders practical applications.3 While this can, to an extent, be overcome by incorporating organic moieties within hybrid perovskite frameworks that form low-dimensional architectures with superior operational stabilities, their electronically insulating character often compromises the resulting photovoltaic performances.[3–5] This issue will be addressed by discussing the capacity of supramolecular engineering in the design of adaptive bio-inspired materials[3] and the use of (photo)electroactive organic species to enhance the functionality of hybrid perovskites by enabling control in response to external stimuli,[4] such as voltage bias,[5] light,[6] and pressure,[7] opening a path toward multifunctional materials and smart photovoltaics.

Schematic of multifunctional perovskite materials responsive to external stimuli, such as pressure.[7]

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