Multifunctional Hybrid Materials for Energy Conversion in Photovoltaics

<u>J. Milić</u>1

¹Adolphe Merkle Institute, University of Fribourg, Switzerland

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 materials³ 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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