

The Dynamic Future of Molecular Crystals

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The adaptive molecular single crystals warrant a particular attention as an alternative choice of materials for light, flexible, and environmentally benign devices, primarily memories, capacitors, sensors, and actuators. Some of the outstanding requirements for application of these dynamic materials as high-efficiency energy storage devices are strongly induced polarization, high switching field, and narrow hysteresis in case of reversible dynamic processes. However, having been studied almost exclusively by chemists, molecular crystals still lack the appropriate investigations that reliably evaluate their reproducibility, scalability, and actuating performance, and some important drawbacks have diverted the interest of engineers from these materials in applications. United under the umbrella term crystal adaptronics, the recent research efforts aim to realistically assess the appositeness of dynamic crystals for applications that require fast, reversible and continuous operation over prolonged periods of time. With the aim to highlight the most recent developments in the research of adaptive molecular crystals, this lecture will provide a critical discussion of their assets and pitfalls. It will also provide some hints on the likely future developments that capitalize on the untapped, sequestered potential for applications of this distinct materials class.