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H- bonded supramolecular ferroelectric materials supported by organoamino phosphonium cations

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Ferroelectric materials are an important class of dielectrics where the direction of their spontaneous electric polarization can be reversed or reoriented by the application of external electric field. Ferroelectric materials are very attractive for their utility in nonvolatile computing devices, capacitors, micro-electromechanical systems (MEMS), semiconductor chips, field-effect transistors (FETs), telecommunication signal processing units, ultrasonic medical imaging devices, and nonlinear optical devices. Perovskite ceramics (BaTiO3, PZT etc.) and some polymers (PVDF and its copolymers) are traditionally being used as commercial ferroelectrics. However, supramolecular ferroelectrics such as organic or organic-inorganic hybrids have also gained great attention due to their synthetic tunability, light weight, thermal stability and flexibility. A large number of molecular ferroelectrics have shown to exhibit ferroelectric behaviour at room temperature and above; croconic acid, 2-phenylmalondialdehyde (PhMDA), 3-hydroxyphenalenone (3-HPLN) and cyclobutene-1,2-dicarboxylic acid (CBDC) are few of them. Ammonium salts based molecular ferroelectrics also show high polarization, large dielectric constant, low dielectric loss and high curie temperatures. These interesting findings have proved the potential of molecular ferroelectrics for practical applications. Herein, I will discuss a new family of polar molecular ferroelectrics that have been synthesized by utilizing phosphonium cations. The phosphonium cations and the anions exhibit rich hydrogen bonding which is responsible for the alignment of the dipoles in polar point group. These new materials exhibit fatigue-free ferroelectric polarization at room temperature, that can be tuned by utilizing various polarizable counter anions.

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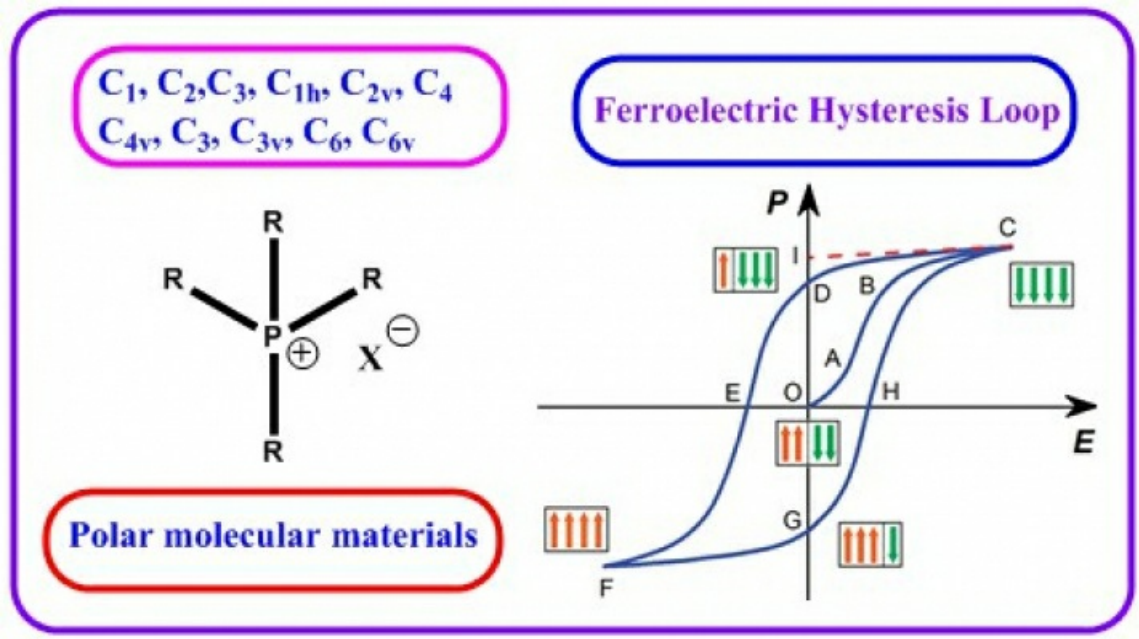

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