Ferroelectric Materials: Pathways to the design of new all-organic and hybrid organic materials.

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Abstract

Ferroelectricity is a property of certain materials that have a spontaneous electric polarisation that can be reveres by the application of an external electric field. Their application uses are wide ranging whether, as capacitors with tuneable capacitance, in sensor applications or in memory applications as ferroelectric RAM to name but a few.

Traditionally, the ferroelectric materials used in applications are inorganic based containing a number of heavy and/or toxic metals. Of which one important class is lead zirconate titanate (PZT). PZT applications depend on the composition of PZT itself with the ratios of lead titanate and lead zirconate it is comprised of. Some of these compositions can see a lead content of up to 46% by weight.

Looking forwards towards the future, a trend has been seen in recent years by the increasing number of recent publications showing the emergence of all-organic or hybrid organic ferroelectric materials, moving away from the traditional heavy metal inorganic based materials. As an alternative, our work examined the feasibility of using organic guanidinium salts and a number of hybrid-organic Iron (II) spin crossover complexes as possible pathways to the design of new ferroelectric materials. We were concerned with their solid-state crystal structures and the structure-property relationships that arose as a result. A prerequisite for ferroelectricity is that, the material must be non-centrosymmetric. A centre of inversion symmetry would cancel out any dipole moment generated in one direction by symmetry.

Short biography

Craig Lawley is a recent graduate from the University of Bath where he received his Master of Chemistry degree, MChem (2016). His other research experiences include metal-organic frameworks (MOFs) and renewable polymers.