

Keynote Lecture

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Unexpected, unusual and unpredictable solid state properties

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Many physical and chemical properties of the solids are directly related to their crystal structures. For example, noncentrosymmetric crystals are required to produce second harmonic generation, ferroelectricity, piezoelectricity, pyroelectricity and multiferroic materials. The crystal engineering tools can be used to modify and fine-tune the chemical properties like stability, reactivity, tautomerism, structural transformation, polymerization, mechanical motion, etc. It is possible to design organic crystals, coordination polymers and metal-organic framework materials with desired physical properties like solubility, crystal bending, guest and gas sorption, storage, separation and transportation, ion exchange, catalysis, magnetism (magnetic ordering, spin crossover), conductivity, optics (multi-photon upconversion, luminescence and sensing, birefringence), negative thermal expansion and processability. As more and more exotic new crystals are generated, unexpected, unusual and unpredictable properties have been discovered. In our laboratory we have encountered a number of such interesting properties such as structural transformations due to solvent exchange, change of composition and dimensionality due to grinding, unexpected photoreactivity of organic crystals and transition metal complexes and centrosymmetric MOFs showing second-order non-linear optical properties. A few examples will be highlighted in this talk.

Keywords: [structural transformation](#), [photoreactivity](#), [non-centrosymmetric crystals](#)