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### Unusual physical and chemical properties of crystalline solids

The physical and chemical properties of the solids are directly related to their crystal structures. For example, non-centrosymmetric 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 made, 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.

### Biography

Jagadese J Vittal has pursued his BSc, MSc and PhD degrees from India and carried out Postdoctoral research from the University of Western Ontario, Canada. He is currently a Professor in the Department of Chemistry, National University of Singapore. He has held a prestigious world class University Chair Professorship at the Gyeongsang National University, South Korea. His major research interests are in the areas of solid state materials. He has published over 490 research papers, reviews and book chapters with ~18000 citations and h-index of 67. He has co-authored a textbook, *Crystal Engineering* and also co-edited two books on crystal engineering. He is a Fellow of Royal Society of Chemistry and Singapore National Institute of Chemistry. He holds Editorial Board Memberships of several journals including *Crystal Growth & Design* and *Scientific Reports*. He had won several awards including Outstanding Chemist Award, CRISP Award, Outstanding Research Award and Best Scientist Award. He has been highlighted in Angewandte Author Profile. He is the Founder and an Organizing Committee Member of Singapore National Crystal Growing Challenge. He is an international Committee Member of Worldwide IUCr Crystal Growing competition for school children.

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