

1.6 Growth and Morphology of Dye-Molecules in Inorganic Crystals

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By molecular engineering, it has been shown that dye-molecules consisting of strong di-polar or octu-polar groups are promising candidates for molecular nonlinear optics. Unfortunately, these types of molecules are difficult to crystallise and it is difficult to obtain a noncentrosymmetric packing with optimised orientation for nonlinear optics and electro-optics.

In crystallography, a phenomenon called organic hourglass inclusions (HIs) was found in the 19th century and is now of interest for crystal growth, spectroscopic and photonic studies. HIs means that simple salts are doped with organic dyes and subsequently show different colours on specific crystal faces in patterns sometimes reminiscent of a bow-tie or hourglass. HIs can be used to illustrate important ideas in solid-state chemistry including Miller planes, crystal habit and its modification by impurities, molecular recognition by surfaces, anisotropy of light absorption, and solid solution structure.

Our aim is to grow nonlinear optical dye molecules in inorganic crystals. Most growth experiments show that it is difficult to obtain HIs with homogeneous inclusions. A successful example is crystalline K_2SO_4 doped with acid fuchsin. Acid fuchsin in K_2SO_4 only grows homogeneously along $\{110\}$. Further work will be undertaken to investigate the characteristics of these HIs crystals and on the growth mechanism .