Helicoidal Crystal Growth and Charge Transport

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Résumé/Abstract

Crystals are straight, by definition. They have sharp edges and flat faces. They are polyhedra. However, molecular crystals that twist as they grow are common, a fact poorly recognized. More than one third of simple molecular crystals are capable of forming twisted morphologies including aspirin, paracetamol, coumarin, DDT, malic acid, and many other common, long-studied molecular materials. The growth and micromorphologies of twisted crystals are discussed. Simulations aimed at understanding when and why crystals sacrifice their long-range translational symmetry will be presented. Meanwhile, crystal twisting introduces a new dimension to materials design. Plastic electronic devices, e.g. foldable LCD screens, smart phones, computers, and solar panels, may depend on organic crystals that carry electricity. We investigate the role twist on the propagation of charge in organic semiconductors. Is charge mobility greater or lesser in a twisted crystal than in its straight configuration? Answers to this question will be provided.

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Bio

Bart Kahr was born in New York City in 1961. He studied chemistry with I. D. Reingold at Middlebury College, with Kurt Mislow at Princeton University (Ph.D., 1988), and with J. M. McBride at Yale University. He was a faculty member at Purdue University from 1990 to 1996 and at the University of Washington, Seattle from 1997 to 2009. After which, he returned to his hometown where he is currently Professor of Chemistry in the Molecular Design Institute at New York University.

Kahr's research group studies the growth, structure, and physical properties of complex organized media. Current projects emphasize crystal growth mechanisms, polycrystalline pattern formation, the development of new methods of metrology using polarized light, and analysis of chiroptical anisotropy structure-property relationships. He also practices the experimental history of chemistry and crystallography, that is those aspects of the development of science that can only be informed by contemporary laboratory experiments. More recently, he has been advocating for changes in the way that universities and government agencies manage scientific misconduct.