

COMPILED AND EDITED BY THE **CONNECT TEAM** BASED ON INPUT FROM THE
FEATURED **RESEARCHERS**

**GAUTAM DESIRAJU (PROFESSOR, SOLID STATE AND STRUCTURAL CHEMISTRY
UNIT)**



(KG HARIDASAN)

A pioneer in crystal engineering

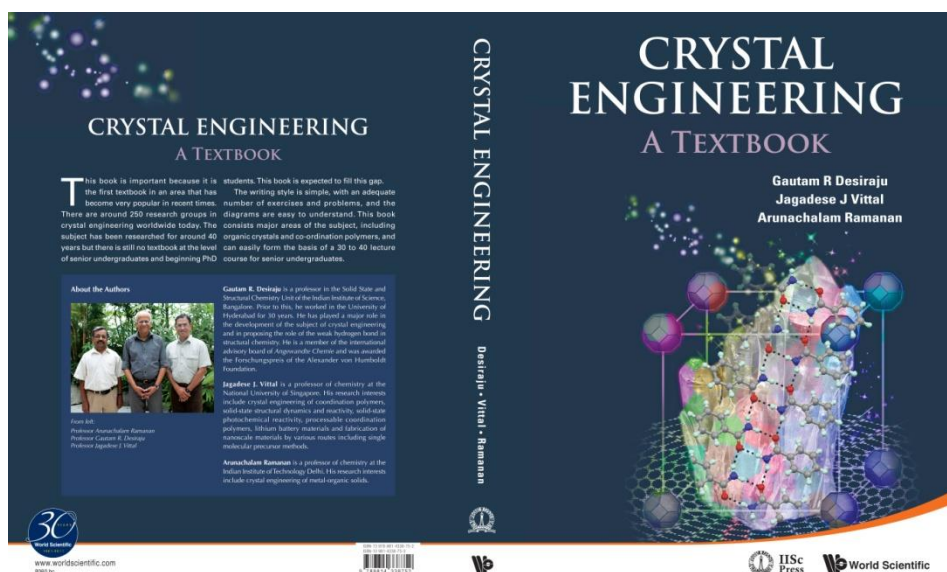
Gautam Radhakrishna Desiraju—one of India’s most eminent chemists—joined the Indian Institute of Science in 2009 after 30 years at the University of Hyderabad. It was he who, in his 1989 book, coined the term “crystal engineering”, which he defined as “the understanding of intermolecular interactions in the context of crystal packing and using it to design new solids with desired physical and chemical properties”. He is also associated with terms such as “weak hydrogen bond” and “supramolecular synthon”, now an integral part of a crystallographer’s lexicon, and is one of the most highly cited Indian scientists. He was president of the International Union of Crystallography from 2011 to 2014 and is currently a

member of the editorial advisory boards of *Angewandte Chemie*, *Journal of the American Chemical Society* and *Chemical Communications*.

In its research, Desiraju's group uses a technique called nanoindentation, in collaboration with U Ramamurty of the Department of Materials Engineering, to understand the mechanical behaviour of organic crystals and to correlate it with the properties of the molecules in these crystals. With this tool, they have studied the properties of the active pharmaceutical ingredient (API) felodipine and also engineered the hardness of an important API, omeprazole. Recently, they have also identified the structural features that enable organic crystals such as N-benzylideneaniline to be highly flexible.

Dual mechanical properties in an organic crystal, namely pressure induced elastic mechanical bending and temperature induced crystal splitting, have been established for the first time by Desiraju's research team. A combinatorial crystal synthesis approach has been explored to design ternary–three component–molecular solids that constitute the crystal structure landscape. This concept of a supramolecular combinatorial library can be profitably extended to the crystallization process, with supramolecular synthons being the constituents of such a library.

Desiraju's lab has also successfully improved the physical and chemical properties of the diuretic drug hydrochlorothiazide using various other compounds with which it can form crystals.



Front and back cover pages of Desiraju's textbook co-authored by Jagadese Vittal and Arunachalam Ramanan (Courtesy: G Desiraju)



Desiraju with his team (Courtesy: KG HARIDASAN)