

A Handbook of Physical Crystallography by S. Ramana Rao. Published by Dr P.S.N. Murthy, 2022, 102p. Price Rs. 200/-

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Crystallography is the most important and fundamental experimental science of determining the arrangement of atoms in crystalline solids and also a fundamental subject in the fields of materials science and solid-state physics (condensed matter physics) and solid state chemistry. In our country X-ray crystallography began with the successful determination of the crystal structures of naphthalene and anthracene crystals in 1929 by trial and error method. The results of these determinations were published in 1930. This beginning however, has an interesting background. Sir C. V. Raman and his students at the Indian Association for the Cultivation of Science in Calcutta were greatly interested in the study of optical anisotropy of molecules from scattering of light. In India the earliest research publication on crystallography was the crystal structure determination of naphthalene and anthracene by K. Banerjee at Indian Association of Cultivation of Science. (Nature, 125, 456, 1930). Further the crystal structure studies have been nurtured by eminent scientists like Professor Sir C.V. Raman, M.N. Saha, K.S. Krishnan, S. Bhagavantam. (Ref : S. Ramaseshan in "Scientific Papers of C.V. Raman: Optics of Minerals and Diamonds" Indian Academy of Science 1988). However, to the best of my knowledge there are no books published on Physical Crystallography available to students of geology and mineralogy. The first book was published by S. Ramana Rao (2019), A Handbook of Physical Crystallography by S. Ramana Rao published by Dr P.S.N. Murthy foreword by a well-known teacher and Professor Jagadiswara Rao Ramayanam who used to teach geologists the fundamental course on crystallography at Sri Venkateshwara University, Tirupati, Andhra Pradesh. The current version is a reproduction of the earlier book with the same author with an additional foreword by another well-known crystallographer Prof. T.N. Guru Row, from the Department of solid state and structural chemistry of Indian Institute of Science.

This concise handbook consists of two parts, viz., first part deals with the basic symmetry operations- rotation axes, reflection planes and inversion centres, and their role in deriving the 32 crystal systems in an elegant and classical way. The author has also explained the symmetry elements/operators in development of crystal systems.

Part 2 discusses about the relationship between the crystal habit and structure with the hand drawn pictorial illustration of lattice planes, glide planes, and methods of space group determination. The author being an excellent teacher, illustrated examples from naturally occurring minerals, viz., garnet, pyrite, spinel, galena, sphalerite for cubic system. For every crystal system the author provides many examples of mineral structure and physical appearance of crystal planes (which is the most unique and classic part of this book). This book also provides the classical graphical representation of the crystal structure formulae determination. Students of mineralogy and geology will be highly benefitted by reading this handbook on physical crystallography.

It is most appropriate here to cite few examples of Indian classic contributions in usefulness of physical crystallography in improving the understanding the physical properties of solids. *Crystal Symmetry and Physical Properties*; S. Bhagavantam, Suri Bhagavantam; Academic P., 1966 - *Crystals - 230 pages (published by the University of California)*. *Group theory and its application to physical problems*: Suri Bhagavantam, T. Venkatarayudu Published in 1959. Dr Bhagavantam was a pioneer developing simple and effective methods to measure elastic constants in Crystals. *Crystallography and Mineralogy - Concepts and Methods*; Editors/ Authors: Professor Ram S. Sharma & Anurag Sharma Published in 2013; Geological Society of India, Bengaluru. The reproduction of earlier book is internationally accepted for the benefits of the students. A well-known example is the book on *The Characters of Crystals: An Introduction to Physical Crystallography* by Alfred J. Moses, Feb 26th, 2010 (Exact reproduction of the earlier version of the book which was published in 1923).

I must emphasise here that there is no text book available by any Indian scholar on the subject of physical crystallography with such a detailed practical methods. Though the text of this book written during 1953, I strongly recommend this handbook for all the university students and research scholars from all the research institutes to improve their basic understanding of physical crystallography in general, and mineralogists in particular.