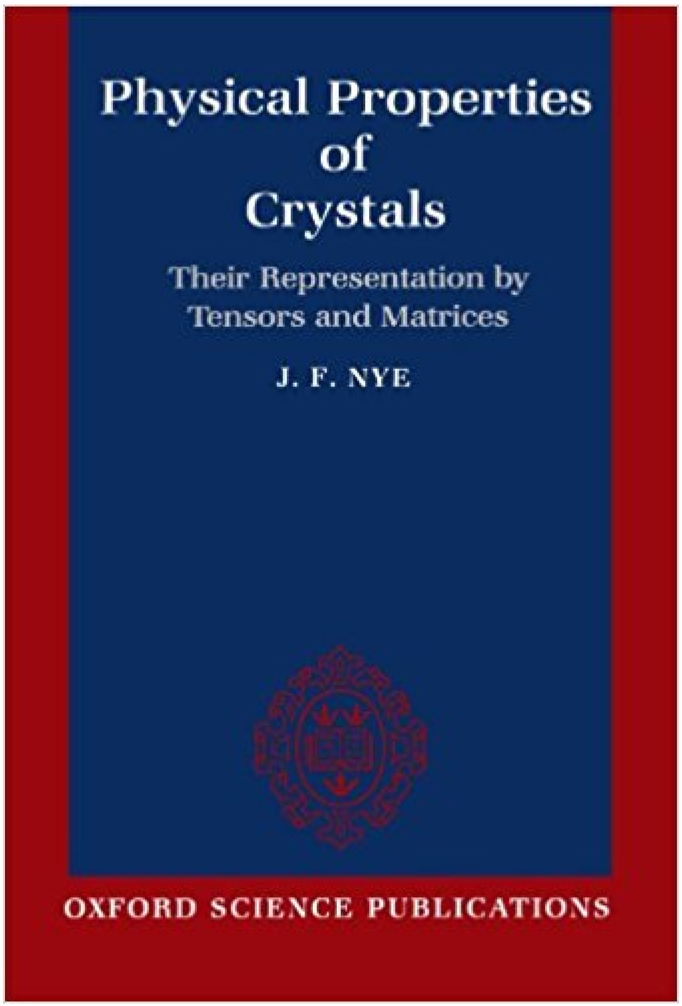
Physical Properties Of Crystals: Their Representation By Tensors And Matrices



Synopsis

First published in 1957, this classic study has been reissued in a paperback version that includes an additional chapter bringing the material up to date. The author formulates the physical properties of crystals systematically in tensor notation, presenting tensor properties in terms of their common mathematical basis and the thermodynamic relations between them. The mathematical groundwork is laid in a discussion of tensors of the first and second ranks. Tensors of higher ranks and matrix methods are then introduced as natural developments of the theory. A similar pattern is followed in discussing thermodynamic and optical aspects.

Book Information

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Customer Reviews

'We all have to be grateful to Dr Nye for giving us such a clearly conceived and well written text.' Journal of Mechanics and Physics of Solids 'Dr Nye is to be warmly congratulated on an excellent book, which it is a pleasure to handle and read.' Mathematical Gazette

J. F. Nye is at University of Bristol.

This is an amazing text. Nye methodically and somewhat rigorously presents the arguments behind why certain property tensors take on specific characters for different crystalline materials. Nye is uncannily lucid in his explanations- don't worry if you have trouble with tensors. Nye has an amazing introduction in this book (I think because he ties things to geometric interpretations rather than algebraic). Similarly, if you aren't familiar with the physics related to the property, or it has been a while, Nye briefly reviews what is relevant and where in the governing equations the properties fit. I would recommend as a prerequisite anÂ Introduction to Crystallography, especially if you are a little rusty on your crystal systems. Nye does give a brief summary, but I found it a little lacking.As far as the main subject of the book, for example, thermal conductivity is actually a second-rank tensor, but for the materials most often encountered (by engineers, anyway), it reduces to a scalar times the identity tensor. This, as well as other properties, reflect the underlying symmetry of the crystalline lattice, and Nye takes us through why certain components of the tensor are zero. This generalizes for higher-rank tensors such as elastic stiffness/compliance, or piezo-x effects, and all are discussed. It is more than just the symmetry of the lattice, however; there are thermodynamic arguments to be made as well, and Nye hits the high points of these as well. He also gives values for the different constants at room temperature for different materials, and in some cases discusses issue with the measurement of the constants (but really, there are better books for this, likeÂ Elastic Constants and Their Measurements).If you are a materials scientist or an engineer/mechanician doing work with solids, this book definitely belongs dog-eared on your bookshelf. I can't recommend this enough.

This book is good for people who has some idea about space groups and point groups in crystallography. Knowledge of those is not necessary but makes it much easier for people who does have that knowledge. Being from mechanical background I have not studied symmetry groups yet. Also, determining properties of second rank tensors by comparing them to quadrics was a little confusing for me since my math background is not that strong. It's an excellent book otherwise for understanding how crystal properties depend on the inherent symmetries present in a crystal and how by reducing the number of independent constants the math can be simplified to a great extent. The book was recommended to me to study wave propagation in anisotropic media. Hearmon's bookÂ An Introduction to Applied Anisotropic Elasticity.Â was more suited towards that once you know the number of independent elastic constants for a particular crystal lattice. If you are interested in knowing how to determine the independent constants, Love's bookÂ A Treatise on the Mathematical Theory of Elasticity (Dover Books on Engineering)Â has a good account of that.

Has a great explanation of Einstein summation notation in it. Its also a super easy and informative read. Assuming you have knowledge of E&M and similar topics.

This book was recommended to me by a graduate student. It is really the first book I've found which presents tensors in a useful and understandable fashion. Would strongly recommend it.

If you are looking to understand this material, and have a background in materials, this is the book to buy.

The book by Nye is considered by many people in the relevant scientific societies as the "bible" of crystal physics. In scientific terms, it is a rigorously written book on tensor algedra which which is the mathematical formalism essential to describe the physical properties of crystals. The mathematical complexity of the book is rather elementary and hence could be used for a senior level advanced undergraduate course as well (typically it is used as a first your graduate course text). The first half of the book discusses equilibrium properties of crystals (permittivity, piezoelectricity, elasticity etc.), therefore a rather modest background in physics is needed. The second half of the book that is devoted to transport properties may require some "general" background on the basic principles of transport phenomena and irreversible thermodynamics. This book, in my opinion, is a very well written book that places the physical properties of crystals in an "easy to comprehend" mathematical framework eloquently. It is an excellent text book. I highly recommend it.

Physical Properties of Crystals: Their Representation by Tensors and Matrices Crystals and Stones: A Complete Guide to Their Healing Properties (The Group of 5 Crystals Series) Transformations Of Coordinates, Vectors, Matrices And Tensors Part I: LAGRANGEÃ¢â ¬â„¢S EQUATIONS, HAMILTONÃ¢â ¬â„¢S EQUATIONS, SPECIAL THEORY OF RELATIVITY AND CALCULUS ... Mathematics From 0 And 1 Book 16) Vectors and Tensors By Example: Including Cartesian Tensors, Quaternions, and Matlab Examples Symmetry, Group Theory, and the Physical Properties of Crystals (Lecture Notes in Physics) Liquid Crystals: Experimental Study of Physical Properties and Phase Transitions 101 Power Crystals: The Ultimate Guide to Magical Crystals, Gems, and Stones for Healing and Transformation Crystals: Crystal Healing For Beginners, Discover The Healing Power Of Crystals And Healing Stones To Heal The Human Energy Field, Relieve Stress and Experience Instant Relaxation !-THIRD EDITION- Crystal Healing: Charge Up Your Mind, Body And Soul - Beginner’s Journey (Crystal Healing For Beginners, Chakras, Meditating With Crystals, Healing Stones, Crystal Magic, Power of Crystals Book 1) The Essential Guide to Crystals: All the Crystals You Will Ever Need for Health, Healing, and Happiness (Essential Guides Series) Crystal Healing: Charge Up Your Mind, Body And Soul - Beginner’s Journey (Crystal Healing For

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