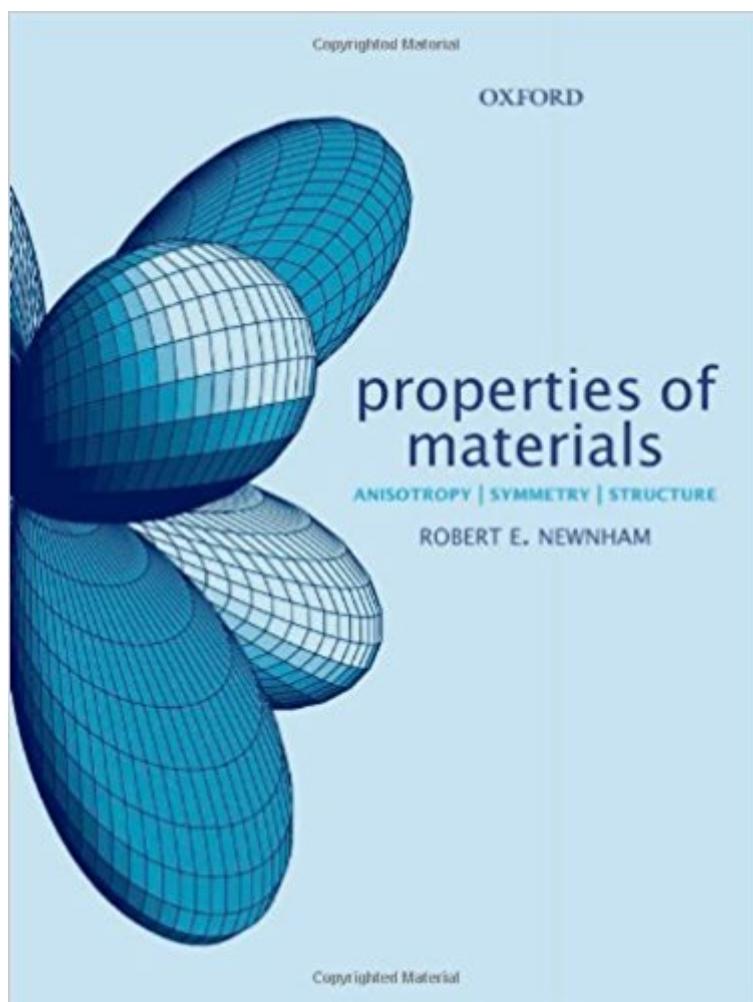


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# Properties Of Materials: Anisotropy, Symmetry, Structure



## Synopsis

Crystals are sometimes called 'Flowers of the Mineral Kingdom'. In addition to their great beauty, crystals and other textured materials are enormously useful in electronics, optics, acoustics and many other engineering applications. This richly illustrated text describes the underlying principles of crystal physics and chemistry, covering a wide range of topics and illustrating numerous applications in many fields of engineering using the most important materials today. Tensors, matrices, symmetry and structure-property relationships form the main subjects of the book. While tensors and matrices provide the mathematical framework for understanding anisotropy, on which the physical and chemical properties of crystals and textured materials often depend, atomistic arguments are also needed to quantify the property coefficients in various directions. The atomistic arguments are partly based on symmetry and partly on the basic physics and chemistry of materials. After introducing the point groups appropriate for single crystals, textured materials and ordered magnetic structures, the directional properties of many different materials are described: linear and nonlinear elasticity, piezoelectricity and electrostriction, magnetic phenomena, diffusion and other transport properties, and both primary and secondary ferroic behavior. With crystal optics (its roots in classical mineralogy) having become an important component of the information age, nonlinear optics is described along with the piezo-optics, magneto-optics, and analogous linear and nonlinear acoustic wave phenomena. Enantiomorphism, optical activity, and chemical anisotropy are discussed in the final chapters of the book.

## Book Information

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## Customer Reviews

It is a great pleasure to be the first person to write a review for the book by Professor Newnham. As a background for those who do not know Prof. Newnham, let me tell you that he is a member of the National Academy of Engineering, and the Ben Franklin Medal Laureate in Electrical Engineering, to name a few of his credentials. What is today known as "piezoelectric composites" is his brainchild, which had an immense impact on modern medical ultrasound and sonar technology. With all that said, off we go to the review. Entropy4Life-----The title of the book is truly a propos to what is covered therein. One cannot help but notice the perfect balance between crystal physics and solid state chemistry throughout the text. Prof. Newnham's prose is simple and clear, which makes the book very agreeable to read. All scientific explanations that are presented are "right on the money," to coin a phrase. Older classical texts on crystal physics such as Nye, Banvanghataman, Juretschke, Mason, Voigt, Wooster etc., which are good books to read, do not go beyond providing a phenomenological description of crystal anisotropy using tensors and matrices. On the other hand, classical and widely popular books on crystal chemistry or Solid State Chemistry, such as Jaffe and West, are excessively descriptive and with barely any mathematical treatment of the phenomena of interest. Prof. Newnham, on the other hand, establishes the necessary mathematical and crystallographic foundation in the first 6 chapters of his book with sufficient clarity and depth. He then proceeds to discuss a wide range of topics in the ensuing 26 chapters in a very systematic fashion.

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