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The elastic constants of zinc are compiled and reviewed; one hundred references are cited. The included elastic constants are: Young's modulus, shear modulus, bulk modulus, compressibility, Poisson's ratio, second-order single-crystal elastic stiffness and compliances, and third-order elastic stiffness. Temperature and elastic-anisotropy effects are also reviewed. Other topics are: sound velocities, elastic Debye temperatures, Cauchy relationships, elastic stability, pressure effects, and theoretical studies. New polycrystalline data are computed from single-crystal data by means averaging methods.

Key words: Bulk modulus; compressibility; Debye temperature; elastic constants; Poisson's ratio; shear modulus; single-crystal elastic coefficients; sound velocities; Young's modulus; zinc.

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1. Introduction

Previous reports in this series discussed elastic properties of iron, nickel, and iron-nickel alloys [1]¹ and copper [2]. Reference 1 also discusses some solid-state-elasticity concepts that are relevant here, including: crystal physics and thermodynamics; temperature effects; relationships between elastic constants and other physical properties, especially the elastic Debye temperature; and relationships between single-crystal and polycrystal elastic constants.

The purpose here is to present a compilation and a review of elastic properties of zinc. One hundred scientific and engineering publications are cited. Both single-crystal and polycrystal elastic constants are considered together with effects of familiar metallurgical variables on the constants.

Zinc is used widely technologically. Some better-known applications include: galvanized iron and steel, die cast-

ings, solders, and alloys. Brasses (zinc-copper alloys) are perhaps the best-known and most useful zinc alloys. Properties and applications of both zinc and its alloys are summarized elsewhere [3].

The first reasonably comprehensive review of anisotropic elastic-constant measurements, by Hearman [4] in 1946, cited only three hexagonal metals: cadmium, magnesium, and zinc. But, hexagonal-metal elastic-property studies have proliferated in recent years. Hearman's [5] more recent review in 1969 cites sixteen hexagonal metals. Except for magnesium, and perhaps beryllium, zinc has received more experimental study than other hexagonal metals. Magnesium has been studied extensively theoretically because its axial ratio is nearly ideal and because it is nearly elastically isotropic. As discussed below, a nonideal axial ratio and a high elastic anisotropy make zinc studies more interesting but also more difficult.

2. Zinc as a Metal

Zinc seems at first to be a relatively simple metal with a relatively low atomic number (thirty). Its electronic

¹ Figures in brackets indicate literature references at the end of this paper.

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Elastic Properties Of Zinc A Compilation

Joan C. Sauerwein, Geraldine R. Dalton



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Elastic Properties of Zinc H. M. Ledbetter, 1977 **Journal of Research of the National Bureau of Standards**, 1978
Publications of the National Bureau of Standards 1977 Catalog United States. National Bureau of Standards, 1978
NBS Technical Note, 1977 **NBS Special Publication**, 1968 **Crystal Elasticity** Pascal Gadaud, 2022-07-20 This book is an original and timeless description of the elasticity of solids and more particularly of crystals covering all aspects from theory and elastic constants to experimental moduli The first part is dedicated to a phenomenological and dimensionless representation of macroscopic crystal elasticity which allows us to compare all crystals of the same symmetry with the concept of anisotropy and to establish new relations between elastic constants Multi scale approaches are then put forward to describe the elasticity at an atomic scale or for polycrystals The relationship between elasticity and structural or physical properties is illustrated by many experimental data The second part is entirely devoted to a Lagrangian theory of vibrations and its application to the characterization of elasticity by means of the dynamic resonant method This unique approach applied to tension compression flexural and torsional tests allows for an accurate determination of elastic moduli of structural and functional crystals varying from bulk to multi coated materials *Standard Reference Data Publications, 1964-1984* Joan C. Sauerwein, Geraldine R. Dalton, 1985 *Standard Reference Data Publications, 1964-1980* Gertrude B. Sherwood, 1981 *NBS Publications Newsletter*, 1978 A newsletter for librarians documentalists and science information specialists **Publications of the National Bureau of Standards** United States. National Bureau of Standards, 1977
Hearings, Reports and Prints of the Senate Committee on Commerce, Science, and Transportation United States. Congress. Senate. Committee on Commerce, Science, and Transportation, 1978 Publications United States. National Bureau of Standards, 1969 **The Journal of the Acoustical Society of America**, 1977 *National Standard Reference Data System Publication List, 1964-1979*, 1980 Data compilations in physics Heinrich Behrens, Gerhard Ebel, 1976 Theory and Application of Quantum-Based Interatomic Potentials in Metals and Alloys John A. Moriarty, 2023-08-17 Atomistic computer simulations are often at the heart of modern attempts to predict and understand the physical properties of real materials including the vast domain of metals and alloys Historically highly simplified empirical potentials have been used to provide the interatomic forces needed to perform such simulations but true predictive power in these materials emanates from fundamental quantum mechanics In metals and alloys especially a viable path forward to the vastly larger length and time scales offered by empirical potentials while retaining the predictive power of quantum mechanics is to course grain the underlying electronic structure of the material and systematically derive quantum based interatomic potentials from first principles This book spans the entire process from foundation in fundamental theory to the development of accurate quantum based potentials for real materials to the wide spread application of the potentials to the atomistic simulation of structural thermodynamic defect and mechanical properties of metals and alloys Authorization of

the Standard Reference Data Act and Review of the National Bureau of Standards United States. Congress. Senate. Committee on Commerce, Science, and Transportation. Subcommittee on Science, Technology, and Space,1978 Standard Reference Data Program Authorization United States. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology,1978 *Integrated Computational Materials Engineering (ICME) for Metals* Mark F. Horstemeyer,2012-07-23 This text delivers a comprehensive overview of the methods of Integrated Computational Materials Engineering ICME and provides clear examples to demonstrate the multiscale modeling methodology It walks beginners through the various aspects of modeling and simulation related to materials processing

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