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A Practical Guide to Metrication
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François Cardarelli

Materials Handbook

A Concise Desktop Reference

Springer

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Dedication

The *Materials Concise Reference Guide* is dedicated to my father Antonio and my mother Claudine, to my sister Elsa, and to Louise Saint-Amour, for their love and support. In addition, I want to express my thanks to my two parents and my uncle Consalvo Cardarelli, who in close collaboration provided valuable help when I was teenager to contribute to my first fully equipped geological and chemical laboratory, and to my personal scientific library. This was the starting point of my strong and extensive interest in both science and technology, and gluttony for scientific and technical literature.

François Cardarelli

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Units Policy

In this book all the units of measurement used for describing physical quantities are those recommended by the *Système International d'Unités* (SI). For accurate conversion factors between these units and the other non-SI units (e.g., cgs, fps, Imperial and US customary) please refer to Cardarelli, F., *Scientific Unit Conversion: A Practical Guide to Metrication*, 2nd edition, Springer-Verlag, London (1999), 488 pp.

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Introduction

Despite the several comprehensive series available in Material Sciences and their related fields, it is a hard task to find grouped properties of metals and alloys, ceramics, polymers, minerals, woods, and building materials in a single volume source book. Actually, the scope of this practical handbook is to provide to scientists, engineers, professors, technicians, and students working in numerous scientific and technical fields ranging from nuclear to civil engineering, easy and rapid access to the accurate physico-chemical properties of all classes of materials. Classes used to describe the materials are: (i) metals and their alloys, (ii) semiconductors, (iii) superconductors, (iv) magnetic materials, (v) miscellaneous electrical materials (e.g., dielectrics, thermocouple and industrial electrode materials), (vi) ceramics, refractories, and glasses, (vii) polymers and elastomers, (viii) minerals, ores, meteorites, and rocks, (ix) timbers and woods, and finally (x) building materials. Particular emphasis is placed on the properties of the most common industrial materials in each class. Physical and chemical properties usually listed for each material are (i) mechanical (e.g., density, elastic moduli, Poisson's ratio, yield and tensile strength, hardness, fracture toughness), (ii) thermal (e.g., melting point, thermal conductivity, specific heat capacity, coefficient of linear thermal expansion, spectral emissivities), (iii) electrical (e.g., resistivity, dielectric permittivity, loss tangent factor), (iv) magnetic (e.g., magnetic permeability, remanence, Hall constant), (v) optical (e.g., refractive indices, reflective index), (vi) electrochemical (e.g., Nernst standard electrode potential, Tafel slope, specific capacity) and (vii) miscellaneous (e.g., corrosion rate, thermal neutron cross section, natural abundances, electron work function, Richardson constant). Detailed appendices provide additional information (e.g., properties and cost of the elements, molten salts and liquid metals, crystallographic calculations), and an extensive bibliography completes this comprehensive guide. The comprehensive index and large format of the book enable the reader to locate and extract the relevant information quickly and easily. Charts and tables are all referenced and tabs are used to denote the different sections of the book. It must be emphasized that the information presented here is taken from several various scientific and technical sources, and has been meticulously checked; every care has been taken to select the most reliable data.