with several unpaired electrons. The volume contains the following magnetic properties of these particles: g factor (in the predominant majority of cases its isotropic part, but in the case of many radicals also the principal components of the g tensor), the hyperfine and the Fermi interaction constants (the isotropic part or, if this is available, the principal components of the tensor), the components of the dipole interaction of the tensor or the parameters of spitting in zero field D and E (for biradicals), the energy of exchange interaction J (for bi- and triradicals). The greater part of these parameters has been obtained by methods of EPR, NMR, electron-nuclear double resonance and electron-electron double resonance. Results obtained by optical detection of magnetic resonance, by the methods of laser magnetic resonance, by muon spin resonance, by spectroscopy of atomic beams, by chemically induced nuclear polarization, and also with the aid of static magnetic susceptibility (for stable radicals) have also been actively utilized.

Already two subvolumes have appeared: 17a devoted to inorganic radicals, two-ion radicals and radical complexes, and 17b, devoted to inconjugated carbon-centered radicals. Subsequent subvolumes will be devoted to element-organic radicals, polyradicals etc.

This new series and its volume 17 are a major supplement to volumes II/1 and II/9a–9d2 published in 1965 and 1977–1980. This supplement summarizes information on magnetic properties of radicals which became available during the period 1975–1985, i.e., at a time subsequent to the publication of volumes II/9a-9d2.

This new volume of the encyclopedia is useful for physicists, chemists and biophysicists, working on the problems of photophysics and photochemistry, molecular mechanisms of photosynthesis, mechanochemistry of solids, radiation physics and chemistry, etc., i.e., the problem of physics and chemistry of all processes in which radicals play an essential role.

Magnetic properties of 3d-, 4d-, and 5d-elements and their alloys and compounds

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Landolt-Börnstein. Numerical Data and Functional Relationships in Science and Technology. New Series. Editors-in-Chief: K. H. Hellwege and O. Madelung.—Group III: Crystal and Solid State Physics, Vol. 19: Magnetic Properties of Metals. Subvol. a: 3d, 4d, and 5d Elements, Alloys and Compounds. Ed. H. P. J. Wijn, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1986. pp. 653.

The current volume 19 of the well-known reference publication "Landolt-Börnstein" is devoted to magnetic properties of metallic materials—pure metals, alloys, and compounds. Since the previous publication in this reference work concerning magnetic properties refers to 1962 (6th edition, V. 2, part 9), it is clear that the present volume has been rewritten practically anew. In assembling this volume the main principle for selecting information was not a detailed description of individual magnetic properties, but a description of different groups of magnetic materials. In the present volume 19, concerned with group III, metals, alloys and compounds are examined the composition of which includes at least one transition element. In a number of cases along with metallic materials semiconductors and even insulators are discussed. In addition to magnetic properties one can find here information also on those nonmagnetic properties of metals on which spin ordering exerts an appreciable influence. The distribution of the material is as follows: volume 19a is devoted to magnetic properties of 3d-, 4d-, and 5d-metals and alloys based on them; volume 19b is devoted to alloys and compounds of d-transition metals with elements of the principal groups of the Mendeleev periodic system of the elements; volume 19c is devoted to 4f- and 4f-metals and their alloys; volume 19d is devoted to magnetic materials utilized in modern technology: magnetically soft and magnetically hard alloys, invars and elinvars, thin films and coatings, and also to metallic glasses.

Volume 19a begins with a chapter on the properties of 3d-metals: paramagnetic (Ti,V), antiferromagnetic (Cr,Mn), and ferromagnetic ones (Fe,Co,Ni). For the first ones only data on the temperature dependence of the magnetic susceptibility are given, while for the second ones information concerning their magnetic structure, susceptibility and magnetic phase diagrams is provided. The most detailed information is presented for ferromagnetic metals. Here one can find data on the crystal structure and elastic properties, on the constants of magnetic anisotropy and magnetostriction, magnetic susceptibility, spin moment and its spatial distribution, on the spectrum of spin waves, on effects associated with the magnitude of the magnetic field near the nucleus, on the value of the g factor, and on ferromagnetic resonance. For example, in the section on the spin moment information is given on the value of the spin moment in Fe, Co, and Ni, on the value of the negative spin polarization in the interstices betwen atoms, and on the nonsphericity of the distribution of spin moment in a cell. Here also can be found neutron data on the value of the spin moment in paramag-

netic iron (above the Curie temperature for bcc and fcc phases). Curves are given for the magnetic form-factor for iron and cobalt, as well as charts of spatial distribution of the spin moment in Fe, Co, and Ni, and also the temperature dependence of the nonsphericity of the spin moment (decomposition into T_{2g}- and E_g-components) for nickel. As everywhere in the reference volume at the beginning of each section the principal formulas and definitions referring to this subject are provided.

The first chapter also gives information on the Fermi surface, the electron structure, the exchange splitting and heat capacity, on optical and magnetooptical characteristics of Fe, Co, and Ni, on the resistance and magnetoresistance, on the thermal conductivity and thermal emf.

Almost equally detailed data are given in the second chapter on binary and ternary alloys of Fe, Ni, and Co (including also ordered alloys). Here, just as in the first chapter, the material is grouped according to the individual properties. For example, in the section on magnetocrystalline anisotropy for the ternary system Fe-Ni-Co regions are indicated where the constant K_1 is positive or negative, for the alloys Fe–Co, Fe–Ni, and Co–Ni concentration dependences of K_1 and K_2 at different temperatures are given, and also the dependence of the anisotropy constants on crystal deformation. In the same chapter information is also given on the 6 systems of alloys formed by Ti, V, Cr, and Mn, and the 26 systems of alloys of the ferromagnetic 3d metals with these elements: phase diagrams, temperature and concentration dependence of the magnetic susceptibility, data on the heat capacity, magnetic moment, magnetic anisotropy and a number of other phsyical parameters are provided.

The third chapter of the volume is devoted to 4d- and 5d-transition metals. Here is given information on the paramagnetic properties—magnetic susceptibility and the Stoner factor, on the coefficient of electron heat capacity and the constant of electron-phonon coupling; detailed temperature dependence of the magnetic susceptibility, charts of magnetic polarizability in strong fields, the value of the Knight shift, information on magnetostriction, magnetoresistance and the Hall effect, on the influence of plastic deformation on magnetic susceptibility. In the last fourth chapter the alloys of 3d-, 4d-, and 5d-elements, both magnetic and nonmagnetic, are examined. Data are given on a broad spectrum of the properties of these alloys, their dependence on composition and temperature.

Translated by G. M. Volkoff