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Bibliography

on

The Analyses of Optical Atomic Spectra

Section 1

$^1\text{H} - ^{23}\text{V}$

NAT'L INST. OF STAND & TECH R.I.C.



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United States Department of Commerce

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NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

τ , Bibliography
on
The Analyses of Optical Atomic Spectra
Section 1

The Spectra of Hydrogen, Deuterium, Tritium, Helium,
Lithium, Beryllium, Boron, Carbon, Nitrogen, Oxygen,
Fluorine, Neon, Sodium, Magnesium, Aluminum, Silicon,
Phosphorus, Sulfur, Chlorine, Argon, Potassium, Calcium,
Scandium, Titanium, and Vanadium

Charlotte E. Moore ✓

Institute for Basic Standards
National Bureau of Standards
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Abstract

The three published volumes on "Atomic Energy Levels", NBS Circ. 467, contain for each spectrum the bibliography that was used in compiling the data. The present work is a continuation of these bibliographies arranged in the same form. The time interval is the span from the respective dates of the earlier publications to the present. The selection of references is restricted to those needed for the preparation of revised tables of atomic energy levels and multiplets.

The bibliography is being published in three Sections each of which covers the same elements as the respective volumes of AEL. The present Section contains reference lists for the elements 1 H through 23 V, corresponding to Volume I. The spectra of a given element are listed in order of increasing stage of ionization. Listings are included for spectra of the 23 elements.

The original papers have been examined for nearly all of the quoted references. A selected list of general literature references is also included.

Key Words: Spectra, Atomic; Analyses of Atomic Spectra; Elements, Spectra of H thru V; Bibliography, Atomic Spectra; Atomic Spectra, H thru V; References to Atomic Spectra.

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		Li III	7			Ne VII	27
Beryllium	4	Be I	7			Ne VIII	27
		Be II	7			Ne IX	28
		Be III	8			Ne X	28
		Be IV	8	Sodium	11	Na I	28
Boron	5	B I	8			Na II	29
		B II	9			Na III	30
		B III	9			Na IV	30
		B IV	9			Na V	30
		B V	9			Na VI	30
Carbon	6	C I	10			Na VII	31
		C II	11			Na VIII	31
		C III	11			Na IX	31
		C IV	11			Na X	31
		C V	12			Na XI	31
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Bibliography

on

The Analyses of Optical Atomic Spectra

Charlotte E. Moore

The present bibliography has been prepared to meet a steady demand for data on atomic spectra, pending the publication of additional Sections of the writer's current series on Selected Tables of Atomic Spectra [1].¹ No attempt has been made to include references to all work on atomic spectra. Many specialized subjects such as transition probabilities, hyperfine structure, isotope shifts, absorption and fluorescence spectra observed in crystals, theoretical investigations and the like, come under the general subject. Individual bibliographies on these specialized topics are more useful generally than a large unselective list of references touching on many related topics. For example, transition probabilities are being handled in a continuing series that complements the present work [2].

The references included here have been chosen for individual spectra on the same basis as those that were given in the three volumes of "Atomic Energy Levels" [3]. They are essentially references that deal with the outer structure of atoms as revealed by their spectra. An attempt has been made to list all relevant references in the time interval between the publication of the respective "Atomic Energy Levels" Volumes and the present time.

The reference catalog at the National Bureau of Standards, maintained for the "Atomic Energy Levels" Program has provided the source material. The earlier format has been retained for convenience.

A limited number of general references precedes the listings under individual spectra which, in turn, are arranged by element. For a given element the spectra are in order of increasing stage of ionization. The elements are in order of increasing atomic number.

The present bibliography is being published in three Sections, each of which covers the elements contained in the respective volume of "Atomic Energy Levels" [3]. Thus, Section 1, the first of the three, contains the relevant literature references known to the writer of all spectra of the elements H through V from 1949 to the present date. Earlier references, similarly selected, are to be found in "Atomic Energy Levels" Volume I, under the separate spectra.

¹ Figures in brackets indicate the literature references on page VIII.

The former practice of describing the content of individual papers by key letters or words has been continued here. The words are self-explanatory; the letters have the following meanings:

C L	Classified lines
E D	Energy level diagram
G D	Grotrian diagram
I P	Ionization potential
I S	Isotope shift
T	Terms (and/or energy levels)
W L	Wavelength
Z E	Zeeman effect
[]	Forbidden transitions
hfs	Hyperfine structure
Osc.Str.	Oscillator strength
α	Correction connecting sets of terms of different multiplicities

As before, the letters "A" and "L" entered in parentheses before the date of the reference denote, respectively, that the paper is an Abstract or a Letter to the Editor.

The references have been chosen on the basis of those needed for the preparation of current Tables of Atomic Energy Levels and Multiplets [1, 4, 5]. They are designed primarily for users who require a knowledge of ionization and excitation energies, resonance lines, other classified lines, term designations, electron configurations, relative intensities, and the like. They refer, in general, to laboratory analyses. There are a few special cases, however, where forbidden lines observed in nebular or coronal spectra provide the best information or the only data on the intervals of the ground terms of selected spectra. Such references are included.

Some scattered references on related topics such as hyperfine structure, Stark Effect, Lamb Shift, Isotope Shift, etc., have, also, been included. These are only incidental however. They are given for two reasons: occasionally such papers contain information on spectral structure or energy levels, and even a limited number of such references may serve as a guide to the investigator whose specialty is related to the study of atomic structure, but not specifically concerned with the analysis of optical spectra. No effort has been made to provide complete listings for such related subjects.

In tabulating the references for a given spectrum the overall plan has been to arrange them in alphabetical order by author and by year, starting with the earlier papers. Owing to the use of the photographic method for publication, this order has not been followed strictly. If excellent reference material became available after the final typing had been completed, additional references were inserted under the proper spectra where space permitted. This has introduced some irregularities in arrangement, but it has also made the bibliography more useful. Nearly all of the references quoted here have been examined by the author. Only a few which were not available have been copied on the basis of abstracts found in the literature.

It is a pleasure to acknowledge with gratitude the helpful suggestions of colleagues who have generously given the author the benefit of their valuable experience and judgment. B. Edlén and his associates have not only furnished revised analyses especially for inclusion, but have also incorporated in the manuscript suggested additions and corrections that enhance the value of the publication. Similarly, Isabel D. Murray has prepared the copy with the painstaking care required for publication by the photographic method.

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F V

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Ne v

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SODIUM (Z = 11)

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Na V

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Na VI

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- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Physics 27, 172, 198 (1964). $x = +120 \text{ cm}^{-1}$ Singlets, I P

SODIUM

Na VII

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Na VIII

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Na IX

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Mg II

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MAGNESIUM

Mg III

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Mg V

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Mg VI

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B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = +1095 \text{ cm}^{-1}$ Doublets, I P

J. Gauzit, Compt. Rend. 262, 523 to 524 (1966). [Mg VI]

Mg VII

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = -538 \text{ cm}^{-1}$ Singlets, I P

MAGNESIUM

Mg VIII

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Mg IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Mg x

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Mg XI

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence

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Mg XII

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Al I

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ALUMINUM

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Al v

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Al VI

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Al VII

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Al VIII

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Al IX

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

ALUMINUM

Al x

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Al xI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Al xII

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence

F. C. Jahoda, F. L. Ribe, G. A. Sawyer and T. F. Stratton, Proc. Intern. Conf. Ioniz. Phen. in Gases (Münich) 2, 1987 to 1999 (1962). C L

Al xIII

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

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SILICON (Z = 14)

Si I

P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L Vac. Ultraviolet

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Si - Continued

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- V. Kaufman, L. J. Radziemski, Jr. and K. L. Andrew, J. Opt. Soc. Am. 56, 911 to 915 (1966). T, C L Vac. Ultraviolet
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SILICON

Si II

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Si III

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Si IV

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SILICON

Si VI

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Si VII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = -450 \text{ cm}^{-1}$ Singlets, I P

Si VIII

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Si IX

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Autoionization

Si X

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Si XI

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Si XII

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SILICON

Si XIII

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Si XIV

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P I

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I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

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P II

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- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

P III

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- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

P IV

- W. C. Martin, unpublished material (1957). T, C L, W L

P V

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 196, 198 (1964). I P

P VI

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P VII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

PHOSPHORUS

P VIII

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P IX

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P X

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P XI

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P XII

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P XIII

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P XV

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I P, T, C L Theory

SULFUR (Z = 16)

S I

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- J. W. McConkey, D. J. Burns and L. Hilton, *Nature* 204, 1180 (1964). [C L]
- Y. G. Toresson, unpublished material (1964). C L, W L
- L. R. Jakobssen, *Ark. Fys. (Stockholm)* 34, No. 2, 19 to 31 (1967). T, C L Infrared, Partial G D
- V. Kaufman, unpublished material (1968). T, C L, W L Vac. Ultraviolet
- J. W. McConkey, D. J. Burns, K. A. Moran, J. A. Kernahan, *Nature* 217, No. 5128, 538 to 539 (1968). [S I], T

S II

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- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 30, 31 (1968). Partial G D, C L
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- Y. G. Toresson, unpublished material (1967). Observations

S III

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SULFUR

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Y. G. Toresson, unpublished material (1967). Observations

S IV

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S V

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S VI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 196 (1964). I P

S VII

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S VIII

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S IX

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SULFUR

S x

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S xi

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S xii

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S xiii

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S xiv

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SULFUR

S XIV - Continued

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S XVI

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965).
I P, T, C L Theory

CHLORINE (Z = 17)

Cl I

S. Avellén, Ark. Fys. (Stockholm) 8, No. 20, 211 to 212 (1954). I P, T,
C L Vac. Ultraviolet

M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 289 to 300 (1958). I P, T

C. J. Humphreys and E. Paul, Jr., NAVORD Report 5920, 43 to 60 (1958);
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S. Avellén, unpublished material (1967). C L

L. J. Radziemski, Jr. and V. Kaufman, unpublished material (1968). T,
C L, W L

Cl II

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 35
(1968). C L

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Cl IV

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Cl VII

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CHLORINE

Cl VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Cl IX

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W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

Cl x

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Cl XI

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Cl XII

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Cl XIV

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ARGON (Z = 18)

Ar i

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C L, W L

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