# Bibliography on The Analyses of Optical Atomic Spectra Section 2

## $^{24}Cr$ - $^{41}Nb$

United States Department of Commerce

National Bureau of Standards

Special Publication 306—2

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UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

# Bibliography on The Analyses of Optical Atomic Spectra Section 2

## The Spectra of Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Gallium, Germanium, Arsenic, Selenium, Bromine, Krypton, Rubidium, Strontium, Yttrium, Zirconium, and Niobium

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Washington, D. C. 20234

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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 by Sections, each of which covers the same elements as the respective volumes of AEL. Section 1 was issued in September 1968; it contains references for the elements $^{1}$H through $^{23}$V, corresponding to AEL Volume I.

The present Section is similarly arranged, giving references to the spectra of the elements $^{24}$Cr through $^{41}$Nb, corresponding to AEL Volume II. For a given element the spectra are listed in order of increasing stage of ionization.

The original papers have been examined for nearly all of the quoted references.



Key Words: Spectra, Atomic; Analyses of Atomic Spectra; Elements, Spectra of Cr through Nb; Bibliography, Atomic Spectra; Atomic Spectra, Cr through Nb; References to Atomic Spectra.

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# Index to Spectra

## Index to Spectra—Continued

## Index to Spectra—Continued

# Bibliography

# on

# The Analyses of Optical Atomic Spectra

Charlotte E. Moore

The present bibliography is a continuation of the work published in September 1968 [1].[1] Selected references are listed to meet a steady demand for data on atomic spectra. No attempt has been made to publish complete reference lists on atomic spectra including numerous specialized subjects. Those listed have been chosen for individual spectra on the same basis of selection as was used for the Volumes on "Atomic Energy Levels" [2]. They are references that deal with the outer structure of atoms as revealed by their optical spectra. They cover the time interval between the publication of the respective Volumes of "Atomic Energy Levels" and the present time.

Section 1 [1] dealt with the elements $^{1}$H through $^{23}$V from 1949 to the middle of 1968. Earlier references were given in "Atomic Energy Levels" Volume I. The present Section, No. 2 in the Series, covers the elements $^{24}$Cr through $^{41}$Nb, corresponding to Volume II, which was issued in 1952.

As in Section 1 the content of individual papers is briefly described by key letters or words. 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 |
| $x$ | Correction connecting sets of terms of different multiplicities |

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."

In general, the references have been selected as those needed to revise and extend the author's Tables of Atomic Energy Levels [2] and Multiplets [3] [4] [5]. They refer mostly to laboratory observations and analyses. There are a few special cases where forbidden lines observed in coronal or nebular spectra provide reliable information on intervals of ground terms of selected spectra. Similarly, some papers on theoretical work are also extremely useful. Such references are included.

A limited number of scattered references on related topics such as hyperfine structure, Stark Effect, Isotope Shift, etc., are also included, but no effort has been made to cover these related subjects completely.

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.

The author is grateful to all who have generously contributed material for inclusion here. Some have made special effort to furnish current references and reprints, and to outline programs in progress in various laboratories. B. Edlén and L. Minnhagen have kindly suggested important corrections in the manuscript, which are much appreciated. Special thanks are due, also, to Isabel D. Murray for her meticulous care in preparing the press copy of the manuscript.

[1] Figures in brackets indicate the literature references on page VII.

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Washington, D. C.,
November 21, 1968

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