A. Introduction

This compendium contains a collection of recent spectroscopic data tables for iron, which—as a widely used first-wall material for magnetic fusion devices—has become of great importance for the assessment of the effects of plasma impurities and plasma-wall interactions as well as for the application of several plasma diagnostic techniques.

Numerical data are tabulated for spectroscopic quantities which are of principal importance for such impurity studies and plasma diagnostics, specifically:

Ionization energies,
Wavelengths,
Atomic energy levels, and
Atomic transition probabilities.

The majority of the critical evaluation and compilation work for these data has been done at the National Bureau of Standards. Most tables are parts of larger tabulations[1–4] containing many other chemical elements besides iron. Excerpting the iron data from these larger compilations required some modifications in the reprinted material, especially the modification of the introductory material with comments and explanations that specifically pertain to the iron spectra. All of the material is of very recent vintage, less than four years old, and one tabulation is still in the process of being published, all under the sponsorship of the National Standard Reference Data System (NSRDS).

However, the different tabulations have been completed at different times. Thus where data overlap, mainly on energy levels and wavelengths, they are sometimes based on different material. Also, there may occasionally be different judgments, by independent evaluators, on the quality of the source material. Thus, some inconsistencies in this overlapping material are found. For example, wavelengths which may be derived from the atomic energy levels of Section E may not always be fully consistent with directly observed line wavelengths in the wavelength tables of Sections C and D. Also, there may be slight inconsistencies in the energy level data contained in the wavelength and transition probability tables as compared with the energy level table itself. But these differences are so small that they should not matter for any plasma applications, and therefore the use of any of these recent tabulations is appropriate. However, we generally recommend using the *primary* tables to obtain data on a specific atomic quantity.

This compendium is divided into six sections—A through F—each having its own pagination. Since the book is prepared in a looseleaf format, it is possible to exchange each section separately with a new tabulation if one should become available in the future. It is our intention to provide such updates infrequently when this is warranted.The editor acknowledges the cooperation of the data compilers and the NSRDS editing staff, which has provided the lists of vacuum ultraviolet lines prior to publication. Also, the permission of NSRDS, as well as that of the American Institute of Physics and the American Chemical Society, to reprint excerpts of these tables is gratefully acknowledged.

References

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