Total Pressure Measurements in Vacuum Technology

A. Berman

(Academic Press, 1985)

In recent years, several books dealing with vacuum technology have included chapters on vacuum measurements. This monograph devoted entirely to pressure measurement provides a more detailed and more complete discussion of the subject.

The author of the book is associated with the Vacuum Calibration Laboratory at the Nuclear Research Center in Israel. Presumably, due to this association, the most comprehensive and distinguishing features of the book are related to metrological issues.

The presentation level is for college students and graduate engineers and scientists generally familiar with vacuum technology. However, the treatment is so basic and presented in such clear nonobfuscating style that it should be understood by technicians, users of vacuum equipment, and other nontechnical associates who want to become familiar with the methods and equipment used in vacuum technology.

The book can certainly be used, for example, for short courses on vacuum technology given by the American Vacuum Society and other organizations.

To indicate the emphasis of the subject matter, the following list of the number of pages and references may be helpful for potential readers.

- Units and terminology—16 pages, 55 references.
- Basic concepts of pressure measurement—30 pages, 70 references.
- Pressure standards—66 pages, 140 references.
- Gauges—110 pages, 390 references.
- Methods of calibration—75 pages, 100 references.
- Calibration for different gases—7 pages, 14 references.
- Performance of hot cathode ionization gauges—34 pages, 48 references.
- Measurement in confined environments—26 pages, 77 references.

Judging from the number of references alone (894 total), the volume is an excellent source book on the subject of low pressure measurement. It also undoubtedly represents a labor of love and dedication of several years duration. Without implying any criticism, the book's greatest value lies as a source-book rather than, for example, an original interpretation of phenomena encountered in the process of vacuum measurement work. As mentioned before, the treatment is basic and tends to discuss well-established equipment and ideas, almost without comment.

The index is generally adequate but has omissions, perhaps forgivable, for the first edition. For example, there are no entries on Density and Absorption and Orbion gauge although they are discussed (p. 35, 63).

Occasionally, graphs are inadequately explained in the text or in the caption, for example, the patterns associated with gas beam distributions (Figures 2.2 and 2.4, p. 25 and 27). There are many such tantalizing items where the explanation can be obtained only by following up the references, which, to be fair, are conscientiously provided.

Generally, there are adequate cautions regarding applicability of equations or observations, also adequate definitions and statements of assumptions. Occasionally, there are omissions. For example, the table on page 34 does not clearly show that the values given are in seconds; in Table 2.5 (p. 46), it is not clear whether the values are normalized to "argon *or* nitrogen" or "argon *and* nitrogen." In Table 4.2 (p. 131), the thermocouple values are said to be at 273 K; but, to be unambiguous, are they at atmospheric pressure?

The book is well edited but not free of errors. For example, p. 57 gives a value of 6×10^{-9} C without clearly identifying C. These and similar minor errors can be easily corrected in a second edition. It would be desirable also to update the material with a more comprehensive discussion of measurement errors and inclusion of newer gauges, such as the convection gauge.

Adhering to the premise that a book is worth acquiring if one uses a single page, graph or table, this book should be a good addition to a collection on vacuum technology. A table listing pumping speeds of various ionization gauges (17 references, 42 entries, p. 346-347) exemplifies this premise.

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Tunable Solid State Lasers II

Edited by A.B. Budgor, L. Esterowitz, and L.G. DeShazer

(Series in Optical Sciences, Vol. 52, Springer-Verlag, 1986)

Tunable Solid State Lasers II is the proceedings of the conference on the same subject held at Rippling River Resort, Zigzag, Oregon, June 4-6, 1986. The proceedings include recent work in several areas of solid state lasers, including identification and growth of laser host-dopant combinations, theory of fundamental tunable laser principles, experimental investigation of laser materials, new color center and rare earth doped lasers, nonlinear frequency shifting, and, of course, developments of well-established tunable solid state lasers such as alexandrite and titanium doped sapphire. In addition, the results of a panel discussion on Cr doped lasers summarize what has been achieved and what future research is anticipated. A highlight of the meeting and proceedings are the contributions of two Russian authors.

The proceedings are divided into ten sections, each presenting several research papers. The first section, on spectroscopy, includes the information gained using two-photon spectroscopy, laser spectroscopy measurements which analyze the optical properties of Rh^{2+}, Ti^{4+} and Cr^{3+} laser materials, and stable spectral hole burning in Ti^{3+} materials.

The chromium spectroscopy section starts with an interesting in-depth discussion of the unique properties of the Cr^{3+} ion which has led to development of a number of Cr^{3+} doped laser materials. The section continues with several papers: Cr^{3+}-Nd^{3+} energy transfer in GSGG, including rate equation modeling of the results; modeling of excited state absorption in Cr doped GSGG and GSAG; fluorescence in Cr^{3+} doped oxide glasses, which has only a 1–10 μs lifetime and strongly non-exponential behavior.

The crystal growth section continues a tradition of this conference—that of increasing the interaction between crystal growers and laser spectroscopists. A number of papers are included: a discussion of the crystal chemistry aspects of Cr^{3+} doped rare earth garnets and the thermomechanical properties of these garnets (with 44 references); crystal growth of $ScBO_3$:Cr^{3+}, a new tunable laser crystal; the results of seeded gradient-freeze growth of Ti:Al_2O_3; the effects of growth conditions on Ti:Al_2O_3 crystal quality; and crystal growth of Ce^{3+} doped laser crystals.

The second largest section is on chromium tunable lasers and includes eight papers: Cr^{3+} doped gallium garnet crystals for tunable solid state lasers; Cr^{3+} doped GSGG and K_2NF_3; flashlamp pumped Cr^{3+}:GSAG and Cr^{3+}:GSGG; long pulse, flashlamp pumped Cr^{3+}:GSGG and constraints on properties of potential laser media; Cr^{3+}:YSAG; Cr^{3+}:$ScBO_3$; transition metal doped fluoride lasers; laser pumped measurements of gain and loss in $SrAlF_5$:Cr^{3+}.

The fifth section covers alexandrite lasers: alexandrite laser amplifiers; a high power injection-locked alexandrite ring laser; an alexandrite low-magnification unstable resonator; and injection locking alexandrite lasers using diode lasers. These

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