

**Lewis Basicity and Affinity Scales: Data and Measurement.** By Christian Laurence (Université de Nantes, France) and Jean-François Gal (Université de Nice-Sophia, Antipolis, France). John Wiley & Sons Ltd: Chichester, U.K. 2010. 476 pp. \$190. ISBN 978-0-470-74957-9.

In this book, Laurence and Gal address Lewis basicity, making a judicious choice of a few specific basicity scales that are collected, organized, and presented as a useful, expanded, and general guide to the topic. The authors are internationally recognized experts in the field, and as such, their individual contributions are current and relevant to the overall theme of the book. Their hope for quantitative Lewis acid/base chemistry has motivated their research for more than 40 years.

The theme of the book addresses a significant limitation of G. N. Lewis's definition of acidity and basicity, in which it is not possible to establish a universal order of acid or base strength. As opposed to the Brønsted definition that uses the proton as an intrinsic reference point, the Lewis definition does not have one. Lewis summarized "that the relative strength depends upon not only the chosen solvent but also upon the particular base or acid used for reference" in his original work. Consequently, there has been a disjointed and qualitative development of knowledge regarding Lewis acidity and basicity, since there are as many possible Lewis basicity scales as there are Lewis acids. The authors do an excellent job of giving perspective to the data available in the literature and framing it in a discernible and understandable form.

Laurence and Gal focus on thermodynamic and spectroscopic data based on the strength of Lewis bases coming from the literature and their laboratories, realizing that there are a limited number of factors that control Lewis basicity. Consequently, the aim of the book is not to provide exhaustive scales on base strength, but rather to serve as a selective guide that bridges a larger and more diverse basicity scale to be used in many branches of chemistry. Each chapter is organized and presented as a self-contained unit in which thermodynamic and spectroscopic data from the most accurate techniques and reliable methods on typical reference Lewis acids are compiled. Begin-

ning graduate students will find the first chapter on general content and definitions instructive as an overview. However, the last chapter on the measurement of Lewis basicity and affinity in the laboratory is especially insightful and useful. The bulk of the book addresses specific affinity scales as separate chapters, such as Gutmann's antimony pentachloride for complexes of covalent metal halides; Brown's boron trifluoride for complexes of amines and alkylboranes; Arnett's 4-fluorophenol and its extensions for hydrogen bonding; the homogeneous scale of diiodine basicity; and the GB, PA, and lithium cation scales.

Accurate measurement and extension of the Lewis basicity range are the subjects of this book. However, it should be pointed out that Lewis's revered concept of valency was his original basis for understanding acids and bases. He was hesitant about using this concept in his definition of Lewis basicity, because valency cannot be measured directly by experiment. Without other recourse, measurements of acidity through complexation or bond energies have ensued, such as those described in the book by thermochemical and spectroscopic means. Regardless of the scale utilized to predict the relative strengths of Lewis bases, it is assumed that a stronger coordinate covalent bond is due to the increased Lewis basicity when the Lewis acid is held constant. From the beginning, Lewis cautioned that factors other than its tendency to donate or accept an electron pair could be important in determining the bond strength of the adduct. Subsequently, quantum mechanical studies have supported Lewis's claim. Nevertheless, the indirect gauge of Lewis basicity and acidity based upon bond strengths remains. Consequently, the book is a noteworthy piece of work and represents a timely and vast accumulation of knowledge regarding Lewis bases that brings together accurate thermodynamic and spectroscopic data on typical reference Lewis acids. As such, it should serve as a useful and general guide to basicity.

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