Acid Catalysis in Modern Organic Synthesis

"Acid is one of the oldest, but the most important catalyst for organic synthesis". That is the starting sentence of this book by Yamamoto and Ishihara, which follows their earlier book "Lewis Acids in Organic Synthesis (2000)", and covers the new developments in the field up to 2006.

Who does not remember their first organic syntheses in school or during the first year of university studies, in which an evil-smelling carboxylic acid and an alcohol were converted into a fragrant-smelling ester by the action of just a single drop of sulfuric acid? However, after G. N. Lewis re-defined acids in 1916, they became more than just a source of H^+: Lewis extended the concept of acids to include compounds that are able to form an adduct with an electron pair of another molecule. Thus, modern synthetic chemistry is not limited to H^+, even though "designer acids" such as chiral phosphoric acids have led to a renaissance of Brønsted acid catalysis over the last few years. Today the synthetic chemist is offered a plethora of Lewis acids. In addition to classical Lewis acids such as BCl_3, $AlCl_3$, and $TiCl_4$, nowadays we are presented with innumerable alternatives possessing valuable properties. For example, $Sc(OTf)_3$ and many of the lanthanide salts tolerate humidity, and have even been successfully employed in water as the reaction medium, while other systems sometimes display new special properties.

In the present compendium, Yamamoto and Ishihara have coordinated this great diversity of know-how by sorting Brønsted and Lewis acid catalysis into 19 chapters written by 39 authors who are experts in their fields. In an introductory chapter about "combined acids", Yamamoto and Futatsugi describe the development from 2000 to 2006 of the method of catalysis with two acids, where an achiral Brønsted or Lewis acid assists a chiral second acid. The following 17 chapters are arranged according to the Periodic Table, starting with catalysis by H^+. While some of the classical Lewis acids, such as B^{III}, Al^{III}, and Ti^{IV}, are treated in separate chapters, others are covered in combined chapters, such as that on magnesium in combination with calcium and zinc, or that on 15 transition metals from vanadium to platinum. The book concludes with a chapter about polymer-supported acids, where examples of catalysis by immobilized Lewis acids are summarized so that the reader does not have to search for them throughout the whole book.

Originating from the book's concept of classifying the content by elements, each author focuses on "his" own Lewis acid and its chemistry. There are only a few cross-comparisons with other elements, in which an author compares the performance of one compound with that of other Lewis acidic elements for a given reaction. However, this is compensated for by the fact that the chosen concept is perfectly suited to provide a rapid overview about the chemistry of a specific element. For classical Lewis acid catalyzed reactions such as aldol or Diels–Alder reactions, the reader has to seek the relevant paragraphs in many different chapters, and therefore someone looking for one of these specific reactions might prefer to consult a specialized monograph or review. Furthermore, it should be noted that most chapters focus on the description of catalytic applications using substrates that coordinate through a heteroatom to the Lewis acid center, whereas the activation of C–C multiple bonds is not discussed so thoroughly.

To summarize, *Acid Catalysis in Modern Organic Synthesis* is an excellent reference book that should be available in every well-equipped chemistry library. It will certainly be helpful for many scientists as a guide through the ever-growing jungle of acids for catalysis.

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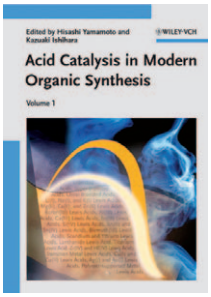

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Arrow Pushing in Organic Chemistry

One of the central challenges that every instructor of organic chemistry faces at the undergraduate level is to properly convey the underlying mechanistic harmony that pervades the different reactions of chemical synthesis, particularly to an audience that often largely consists of students whose interest is low because they are merely fulfilling a requirement and/or believe that rote memorization is the best way to master the material. This new text from Daniel Levy, *Arrow Pushing in Organic Chemistry*, was deftly designed with these challenges in mind. Over the course of eight chapters, Levy provides a well-written précis of the main topics in introductory organic chemistry, focusing in particular on bond polarization, resonance, and fundamental arrow pushing, to illustrate just how unified organic chemistry is at a mechanistic level. Each chapter then concludes with a series of 20 to 30 well-conceived problems for students to practice the key topics highlighted in the preceding pages.