Efficient Joints, which lists all of the factors that a designer must take into consideration in designing a bonded joint for laminated composite structures.

The last chapter, which deals with the analysis and design of bolted/riveted joints for composite structures, has a flavor similar to that of the preceding chapter on bonded joints. The author presents the philosophy behind the design and analysis of bolted joints from a general point of view such that it can be used for many different composite materials systems. In the words of the author, "one purpose of such a presentation is to define the minimum test program that can be used to adequately characterize bolted joints in any composite material." The details of the stress field in a composite bolted joint and their effects on the strength of the joint are described methodically. Effects of fiber pattern on the failure modes and consequently on the strength are described. Correlation between tests and theory are provided, and semi-empirical formulas for the stress concentration factor at failure are derived. The chapter ends with a section on Rules of Thumb for Designing Structurally Efficient (bolted/riveted) Joints.

One of the drawbacks of this book is that the chapters are written by different authors, and another is that the first five chapters read more like a review paper than a comprehensive treatise on the respective topics. The reader is expected to be very familiar with the topic of joints in composite structures, in which case the book does not fully serve its intended purpose. There is no continuity between the chapters, which can be an advantage in the sense that a chapter can be read without reading the preceding ones. Readers may find the references listed at the end of each chapter useful. This is particularly true for young researchers who would like to begin a research program in composite joints and repair. As already mentioned, Chapters 6 and 7 are written in a comprehensive manner and will be very useful for practicing engineers working in the field of design and analysis of composite joints and repairs. The comments made here should not be taken as a criticism of the editors or the authors but rather as a reflection on the nature of a book about an emerging and evolving field of composite materials research. Such books lay the foundation for future authors, who may plan to write a more comprehensive textbook with a unified treatment on this topic.

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Ignition Handbook

Vytenis Babrauskas, Fire Science Publishers, Issaquah, WA, 2003, 1116 pp. plus CD database, $198.00 (book) and $60.00 (CD database)

Ignition of materials is a complicated subject whether ignition is deliberate (i.e., internal combustion engine) or not (i.e., unwanted fires). The author succeeds in combining both types of ignition circumstances into a well-documented and useful compilation for the novice as well as the expert. Even though the major focus of the handbook is on the prevention of unwanted fires, a significant amount of valuable information is available for the student or research scientist who has an interest in ignition characteristics. The overall organization and layout of the handbook represents a well-thought-out strategy for facilitating a better understanding of the topic.

Chapter 2 provides an excellent glossary of terms and acronyms that are frequently used in the field, which is useful for newcomers to the field. Chapter 3 contains a brief summary of combustion fundamentals and chemical kinetics, both of which are important for understanding ignition in various systems. Chapters 4–7 address ignition mechanisms and characteristics of conventional gaseous mixtures, dust clouds, liquids, and common solids. These chapters discuss the basic theory associated with the ignition system as well as the mechanisms that influence the ignition characteristics such as pressure, temperature, oxygen concentration, shock or compression sensitivity, molecular structure, diluents, and safety considerations. Chapter 8 is an overview of ignition of metal dust clouds and single particles. Both empirical and theoretical aspects are described in detail, in addition to the effects of moisture, available oxygen, and flow velocity on ignition. The detailed discussion on common ignition sources given in Chapter 11 should prove useful to the fire prevention community. Each possible type of ignition mechanism is presented and well discussed, covering methodology, techniques, and general principles. Chapter 14 is an exceptional collection of information on specific materials and devices and can be helpful in research investigations beyond the topic of ignition alone. Specific details include types of metal fuels, reactive gases, polymers, oxidizing compounds, oils, safety, techniques, flame and ignition probabilities—to name just a few.

Overall, this book, with its experimental and theoretical contributions, successfully addresses the complex phenomena of ignition and its characteristics. Various modes and mechanisms of ignition (specifically focusing on preventative methods) are presented and carefully explained using past and present work of the foremost authorities in each topic. From a nontechnical standpoint, it contains a plethora of interesting and informative color photographs illustrating common unwanted encounters with ignition, heat, and combustion.

In summary, I highly recommend that those studying any aspect of ignition, especially in the area of fire prevention, should include this ignition handbook in their personal technical library.

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