Review of:
Propellants and Explosives: Thermochemical Aspects of Combustion

Naminosuke Kubota
Wiley VCH [ISBN 3-527-30210-7], 2002

M. K. Hudson
Dept. of Applied Science, University of Arkansas at Little Rock, Little Rock, AR 72204 USA

Kubota's new title covers a wide area, as its name suggests. However, as its subtitle indicates, the author has focused on the thermo aspects of combustible materials. An examination of the book shows that it contains nine chapters, which can be broken down into three major groupings (the author indicates four). Chapters one to three cover the thermodynamics concepts necessary to understand energetic materials used in the combustion field, as well as reviewing some of the phenomena of combustion. Topics covered in these sections include the formation of shock and detonation waves, equilibrium and reaction rates, as well as flame structure and ignition processes, which provide a good, in-depth review. While presenting a considerable number of equations, necessary to explain the phenomena and basis for combustion, the author uses figures and good explanations in the text to guide both the combustion scientist and technical users along.

The second portion of the book actually deals with the combustion of energetic materials, with Chapter four providing a general overview. Chapters five through seven provide a fairly in-depth look at the uses and thermodynamics of these materials, discussing the combustion wave structure, burning rates, and associated parameters for each type of material presented. Each type of material is covered in a similar manner, which allows them to be compared. Again, the author makes good use of graphs, tables, and figures to make his points and instruct the reader in many of the finer points. In particular, I found the use of flame photographs from strand burners interesting, as he illustrated the various zones (dark and luminous) seen for the conditions of the experiments involved. Related to these figures, the author also provides a very good explanation of then use of strand burners in appendix B.

The last part of the book covers the uses and applications of this knowledge. Chapters eight and nine present materials on the combustion of explosives and rocket motors. In particular, the sections on the use of explosives for blasting, gun propellants, and rocket propulsion were very informative. The explanation of co-axial burning and end burning rocket propellant grains, along with an excellent discussion of the phenomena observed during a solid motor run will be put to good use by students and others seeking practical knowledge on such topics. The equations concerning and the discussion of instabilities in rockets provided a fresh view to this reader, and will be used in future classes. Also, the discussion on ignition and transients that are seen will be of significant use to our research group as we design new experiment and attempt to model similar behavior that we are studying.

In summary, I find Kubota's book to be a very good work, and I plan to utilize it in the classroom as well as in our research. While it is not meant to replace the classics by Glassman and others, it does provide a discussion of the

combustion of solid materials. It does a good job of providing updated examples and a new look at combustion phenomena, particularly that of solid energetic materials. While his audience appears to be the advanced undergraduate or graduate student, others working in the combustion field should be able to put the topics presented to good use, and it is recommended for inclusion in their technical libraries.