Book Review

Polymers and Light. Advances in Polymer Science, 168 Edited by Thomas K. Lippert (Paul Scherrer Institut, Switzerland). Springer-Verlag: Berlin, Heidelberg, New York. 2004. xii + 360 pp. $299.00. ISBN 3-540-40471-6.

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When one thinks of the interaction of light with polymers, many topics immediately come to mind. Certainly some of the most interesting technological applications of light and polymers deal with the interaction of high-intensity pulsed lasers and synchrotron radiation with polymeric materials. This is the focus of this outstanding book, which in every respect lives up to the high standards that are a hallmark of the *Advances in Polymer Science* series.

The book opens with a chapter by Georgiou, who gives a thorough and easy-to-follow description of the use of pulsed lasers to remove polymers on a variety of substrates. An excellent case is made for the use of pulsed lasers over other cleaning methods, which is sure to entice those interested in fast and efficient methods for removing polymer materials from surfaces. Such pulsed laser methods are shown to be highly efficient and particularly effective in art restoration. The decomposition of both pristine polymers and those doped with small molecules designed to enhance the degradation process are described. A particularly interesting discussion of the roles of photochemical, thermal, and photomechanical processes in laser-induced decomposition of polymers is given. The reader can easily follow up on mechanistic details by reviewing the copious number of references that are listed.

The second, and by far the largest, chapter by Lippert deals with all aspects of laser ablation and its applications. It has almost 400 references and serves as a tour de force of the history and major applications of laser ablation. Emphasis is on the mechanisms of ablation in a wide variety of materials. Applications described include dry etching of resists and the fabrication and structuring of materials on the micrometer and nanometer scales. Each subtopic is conveniently divided into several sections that contain experimental descriptions in order to familiarize the reader with the details of a particular application. The nuances of the laser sources and the analytical techniques used to evaluate laser ablation processes, both in static and real time modes, are presented in a very readable format. From the details of the processing methods and the clear account of the chemistry associated with each ablation process, this chapter is sure to be useful to both novices and skilled practitioners in the area.

The final two chapters are shorter and concentrate on the use of femtosecond laser ablation processes (by Krueger and Kautek) and synchrotron radiation in ablation and etching of polymer materials (by Zhang). The nature of the femtosecond laser pulses and their unique ability to overcome thermal problems often associated with laser processing using longer lived laser pulses is carefully described with reference to machining of inorganic dielectrics and polymers such as polycarbonate, poly(methyl methacrylate), poly(ethylene terephthalate), and poly(tetrafluoroethylene). Uses for femtosecond laser processing include applications in the biosensor, dental, and ophthalmology fields. The final chapter is a well-documented review of the differences between ablation using synchrotron radiation and pulsed lasers to etch and ablate several polymers. Morphological characterization using optical and scanning electron microscopy to evaluate the shape and nature of the etched surfaces gives a clear picture of the types of machining possible using synchrotron radiation. A total chemical description of synchrotron etching of target polymers is obtained by infrared spectroscopy of the etched polymers and mass spectrometry of the gaseous effluent resulting from the decomposition processes.

In conclusion, this well-conceived book on the use of pulsed lasers to process polymers should serve as an excellent source for anyone attempting to come up to speed on this timely subject. All sections are extremely well-referenced, providing the reader with the resources necessary to implement any of the techniques described. One can ask no more of a book in this series.

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Sax's Dangerous Properties of Industrial Materials, 11th Edition. By Richard J. Lewis, Sr. (Lewis Information Systems, Inc.). John Wiley & Sons, Inc.: Hoboken, NJ. 2004. $595.00 print set (other pricings available for CD-ROM and online versions). ISBN 0-471-47662-5 for print set.

The 11th edition of this three-volume set contains over 2000 new entries, updates of over 1000 more, and now includes "Immediately Dangerous Life or Health (IDLH)" levels for approximately 1000 chemicals. This resource offers data on toxicological, fire, reactivity, explosive potential, and regulatory information. Each entry includes, where available, the DPIM code, hazard rating, CAS number, DOT number, molecular formula, molecular weight and line structural formula, a description of the material and physical properties, and synonyms. Many formats for the set are available: three-volume print set, CD-ROM, print set plus CD-ROM, online database, and CD-ROM networkable versions. See the Wiley Web site for pricing options.

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