

House Beautiful

750

Designer Secrets



Exclusive
Design Ideas
from the Pros



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from the Editors of
House Beautiful
Magazine

Text by Kate Sloan



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Preface

Materials processing with lasers is an expanding field which is captivating the attention of scientists, engineers, and manufacturers alike. The aspect of most interest to scientists is the basic interaction mechanisms between the intense light of a laser and materials exposed to a chemically reactive or nonreactive surrounding medium. Engineers and manufacturers see in the laser a tool which will not only make manufacturing cheaper, faster, cleaner, and more accurate but also open up entirely new technologies and manufacturing methods that are simply not available using standard techniques. The most established applications are laser machining (cutting, drilling, shaping) and laser welding. Increasingly, however, lasers are also being used for surface hardening, annealing, and glazing. Laser *chemical* processing (micro-patterning and extended-area processing by laser-induced etching, material deposition, chemical transformation, etc.) has actual and potential applications in micromechanics, metallurgy, integrated optics, semiconductor manufacture, and chemical engineering.

This book concentrates on various aspects of laser-matter interactions, in particular with regard to laser material processing. Special attention is given to laser-induced chemical reactions at gas-, liquid-, and solid-solid interfaces. The intention is to give scientists, engineers, and manufacturers an overview of the extent to which new developments in laser processing are understood at present, of the various new possibilities, and of the limitations of laser techniques. Students may prefer to read the book selectively, not troubling themselves unduly with detailed calculations or descriptions of single processes.

The book is divided into six parts, each of which consists in turn of several chapters. The main symbols, conversion factors, abbreviations, acronyms, and mathematical functions and relations used throughout the text are listed in Appendices A.1–A.3. The different materials investigated are listed in Appendices B.1–B.10. These give readers a quick and comprehensive overview of the “state of the art” and direct them to the original literature of a particular area of interest. Tables I–V are intended to encourage the reader to use the

formulas presented for rapid estimation of various quantities. An extensive subject index can be found at the end of the book.

I wish to thank my students and all my staff for valuable discussions and critical reading of various parts of the manuscript. I am deeply indebted to Dr. N. Arnold and Prof. B. Luk'yanchuk for many suggestions for improvements to the manuscript. Last but not least, I wish to express my deep gratitude to my secretary, Dipl.-Ing. Irmengard Haslinger, for her tireless assistance in writing this book.

Linz, July 1995

Dieter Bäuerle

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