in this paper, the system can simulate low ramp rate industrial convective reflow profiles and simultaneously measure the warpage of PWBAs. A computational fluid dynamics (CFD) model of the system was developed to determine how to increase the system's heating rate. The CFD model was used to perform a design of simulations (DOS) and regression analysis. The validated regression results will be used to predict oven design parameters to enable the next iteration of the convective system to simulate high ramp rate convective reflow profiles. This paper will show that the presented system is a powerful tool for measuring the warpage of PWBs, PWBAs, and chip packages.

2) **Electron beam lithography in nanoscale fabrication: recent development** Tseng, A.A.; Kuan Chen; Chen, C.D.; Ma, K.J.; Issue Date: April 2003 Page(s): 141–149

Miniaturization is the central theme in modern fabrication technology. Many of the components used in modern products are getting smaller and smaller. In this paper, the recent development of the electron beam lithography technique is reviewed with an emphasis on fabricating devices at the nanometer scale. Because of its very short wavelength and reasonable energy density characteristics, e-beam lithography has the ability to fabricate patterns having nanometer feature sizes. As a result, many nanoscale devices have been successfully fabricated by this technique. Following an introduction of this technique, recent developments in processing, tooling, resist, and pattern controlling are separately examined and discussed. Examples of nanodevices made by several different e-beam lithographic schemes are given, to illustrate the versatility and advancement of the e-beam lithography technique. Finally, future trends in this technique are discussed.

3) **Acid Decapsulation of Epoxy Molded IC Packages With Copper Wire Bonds** Murali, S.; Srikanth, N.; Issue Date: July 2006 Page(s): 179–183

Epoxy molded IC packages with copper wire bonds are decapsulated using mixtures of concentrated sulfuric acid (20%) and fuming nitric acid in an automatic decapping unit and, observed with minimal corrosion of copper wires (0.8-6 mil sizes) and bond interfaces. To attain maximum cross-linking of the molded epoxies, the post mold cured packages (175 degC for 4 h) were further, aged at high temperature of 150 degC for 1000 h. These packages are decapsulated using mixtures of higher ratio of concentrated sulfuric acid (40%) along with fuming nitric acid. The shear strength of copper wire bonds with 1 mil (25 mum) diameter of the decapsulated unit is higher than 5.5 gf/mil2. The present study shows copper stitch bonds to Au, Cu, Pd, and Sn alloy plated surfaces are less affected on decapping, with a few grams of breaking load on stitch pull test, while stitch bonds on silver plated surfaces reveal lifting of wire bonds on decapping

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BOOK REVIEW: PORTABLE CONSUMER ELECTRONICS: PACKAGING, MATERIALS, AND RELIABILITY

By Sridhar Canumalla and Puligandla Viswanadham
Published by PennWell

This book titled "Portable Consumer Electronics: Packaging, Materials, Reliability" is written by two veteran technologists in the industry for engineers working in the field of Portable Consumer Electronics. The authors said in the Preface, "This book is written at a level that assumes only a basic knowledge in the fundamentals of physics, chemistry and engineering at the undergraduate level." It is written for the practicing packaging engineers in the portable electronics sector of our industry. As the title indicates authors have focused their writing on packaging (a la assembly), materials, and reliability. The authors have years of distinguished career in the industry, including the portable consumer electronics industry. They have invested their knowledge and experience in the pages of this book.

The words "Portable Consumer Electronics Products" cover a broad spectrum of electronic products with diverse packaging requirements. However there is a common thread of portability and consumer requirements that sets it apart in Packaging Technology from other electronic products. While much of the technologies are fundamental to all aspects of the packaging industry, it is the focus and practice that distinguish this book from the other packaging technology books.

Chapter 1 introduces the topic of Portable Consumer Electronics with a specific description of what "portability index" means. Chapter 2 articulates the technical challenges in packaging for the portable electronics products. Chapters 3 to 6 cover the topics of PWB technology, first level packaging, 2nd level packaging and board assembly, i.e. the topic of packaging, assembly and materials. Chapters 7 to 9 cover reliability statistics, reliability, and failures and prevention. The last chapter, titled Future Trends in Portable Electronics Products, is devoted to an educated look at what the needs are for future electronic products and what technology and materials are in development to meet those needs. An excellent feature in this book is the reference section at the end of each chapter and suggested reading to help the readers to dig deeper.

I enjoyed reading this book. The three chapters on Reliability Statistics, Reliability of Electronic Assemblies, and Failure and Prevention are particularly valuable for the practicing engineers. These are areas where classroom knowledge is seldom enough as many of us have learned from painful experiences. The authors have lovingly shared their expert knowledge and collective experiences in those pages.

Portable Consumer Electronics is a fast expanding market with rapidly evolving product functions and packaging technologies. This book is a good compelling read for the practicing engineers in the field and a ready relevant reference in their library. It is a very good and worthwhile addition to our literature.

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