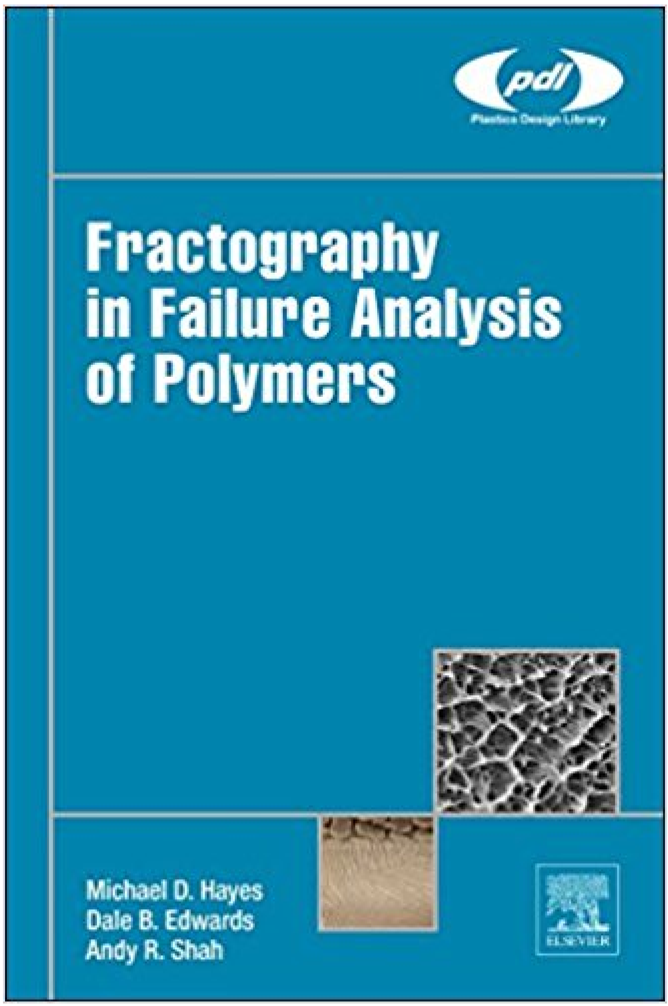
Fractography In Failure Analysis Of Polymers (Plastics Design Library)



Synopsis

Fractography in Failure Analysis of Polymers provides a practical guide to the science of fractography and its application in the failure analysis of plastic components. In addition to a brief background on the theory of fractography, the authors discuss the various fractographic tools and techniques used to identify key fracture characteristics. Case studies are included for a wide range of polymer types, applications, and failure modes, as well as best practice guidelines enabling engineers to apply these lessons to their own work. Detailed images and their appropriate context are presented for reference in failure investigations. This text is vital for engineers who must determine the root causes of failure when it occurs, helping them further study the ramifications of product liability claims, environmental concerns, and brand image.Presents a comprehensive guide to applied fractography, enabling improved reliability and longevity of plastic parts and productsIncludes case studies that demonstrate material selection decisions and how to reduce failure ratesProvides best practices on how to analyze the cause of material failures, along with guidelines on improving design and manufacturing decisions

Book Information

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Customer Reviews

There is good information in this book and that is hard to find. I was, however, surprised by its size. I had assumed this would be the size of similar reference books. It is not. It measures approximately

6-1/4 inch by 9-1/4 inch. Smaller pages equal smaller figures etc.

I started to scan it and ended up reading entire sections. Fantastic photos, very helpful. Explanations are clear, concise and reference the photos. This will quickly become a standard reference. Font is easily read. I like the size of the book, easily carried to the site or other places.

It is welcome that a new book on product fracture should appear now, because the subject has been long neglected, despite its importance for improving product safety. About half the book deals with the form of fracture surfaces and the many details found there that can point to the cause or causes of failure, such as hackles and branch points. The rest of the book, the final half, describes some 21 cases in which the authors have investigated for their company, ranging from pipes and storage tanks to consumer products and mouldings. The former part of course supports the latter, especially in describing the various experimental methods used for examining fractures such as optical microscopy and scanning electron microscopy or SEM. Unfortunately they omit mention of the now widely available USB microscopes which are not only very low cost but give direct images to the computer to which they are attached. In my own experience of fractography, such devices have revolutionised working with multiple failed samples. They also omit discussion of the use of SEM or ESEM in analysing elemental composition of samples, often a key method in investigating contaminated materials. If anything, the book should have extended the discussion to include scanning calorimetry (DSC) for looking at the thermal properties of polymers, as well as infra-red spectroscopy for chemical analysis. Indeed, the chemical make-up of polymers (repeat unit, molecular weight etc) receive very little attention, despite the importance of the subject in analysing failure modes. Such failure modes include SCC or stress corrosion cracking caused by attack of the polymer by strong reagents such as acids and alkalis, as well as powerful oxidising agents such as chlorine. The first part could also have discussed stress concentrations in greater detail, since so many product fractures occur when cracks are initiated at outer corners or holes in the product. There is a very large literature on the subject since it has been so important in aerospace failures among many other disasters (the Comet airplane crashes come to mind here).The cases are well described in some necessary detail such as explanatory figures to show how critical stresses arose in a product (such as a polycarbonate bottle cap). They describe some special methods such as birefringence for examining frozen-in strains in large SAN battery cases, which cracked at their bases and led to acid release and subsequent damage. Such a method deserves better understanding as it applies to many transparent polymers, and can be used for quality control for example. I have used this method myself for examining battery failures in polycarbonate, and have described it in our recent book, Forensic Polymer Engineering (Woodhead, 2010), soon to be updated with a second edition. Pipe failures are well discussed in several cases in the new book as are the fittings for such pipes. There have been many well publicised failures of plastic pipes (often PP or PE) due to oxidation from chlorine in the supply and use at higher temperatures with hot water. Indeed, it led to one of the largest class-actions in the USA when aggrieved home owners sued large companies like Shell and DuPont for supplying such materials. Acetal resin supplied by DuPont for fittings were especially susceptible and often failed first in such how water supplies. One of the cases deals with failure of an acetal fitting. The failure causes in their cases range from poor design, or manufacture as well as chemical attack or attack by organic fluids in ESC.The book is an excellent source for actual failure cases and should be read widely by users and professionals such as insurers and lawyers, as well as product designers. Such readers should also be aware of several other useful texts in the same area.

Nicely done

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