Introduction

The *Handbook of Plastics Joining* is a unique reference publication that provides detailed descriptions of joining processes and an extensive compilation of data on the joining of particular plastic materials. Although the basic characteristics of joining processes are generally well defined by manufacturers, data on joining particular plastics is not well compiled or easily accessed. This volume serves to turn the vast amount of disparate information from wide ranging sources (i.e., conference proceedings, materials suppliers, test laboratories, monographs, and trade and technical journals) into useful engineering knowledge.

Joining a molded plastic part to another part composed of the same or a different plastic material or to metal is often necessary when the finished assembly is too large or complex to mold in one piece, when disassembly and reassembly is necessary, for cost reduction, or when different materials must be used within the finished assembly. Thermoplastics are frequently joined by welding processes, in which the part surfaces are melted, allowing polymer chains to interdiffuse. Other methods used in joining plastics are chemical bonding, in which a separate material applied at the bond line is used to bond the two parts, and mechanical fastening, which uses fasteners such as screws or molded-in interlocking structures for part attachment.

The information provided in this book ranges from a general overview of plastic joining processes to detailed discussions and test results. For users to whom the joining of plastics is a relatively new field, the detailed glossary of terms will prove useful. For those who wish to delve beyond the data presented, source documentation is presented in detail.

In compiling data, the philosophy of Plastics Design Library is to provide as much information as is available. This means that complete information (as it was presented in the source document) for each test is provided. At the same time, an effort is made to provide information for as many joining process and material combinations as possible. Therefore, even if detailed results are not available (i.e., the only information available is that a joining process is incompatible for a particular material), information is still provided. The belief is that some limited information serves as a reference point and is better than no information.

This publication contains data and information from many disparate sources. In order to make the product most useful to users, Plastics Design Library arranges information to be easily accessible in consistent formats. Flexibility and ease of use were carefully considered in designing the layout of this book. Although substantial effort is exerted throughout the editorial process to maintain accuracy and consistency in unit conversion and presentation of information, possibility for error exists. Often these errors occur due to insufficient or inaccurate information in the source document.

How a material performs in its end use environment is a critical consideration and the information here gives useful guidelines. However, this or any other information resource should not serve as a substitute for actual testing in determining the applicability of a particular part or material in a given end use environment.

We trust you will greet this reference publication with the same enthusiasm as previous Plastics Design Library titles and that it will be a useful tool in your work. As always, your feedback on improving this volume or others in the PDL Handbook series is appreciated and encouraged.

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How To Use This Book

This book is divided into two major sections. Section I, including Chapters one (1) through fifteen (15), provides a detailed review of the literature on joining processes, including recent developments and the latest experiments. Welding processes that generate heat through friction (spin, vibration, ultrasonic welding), by use of an external heat source (heated tool, infrared, laser, hot gas, extrusion, radio-frequency welding), and by heating an implant placed at the joint line (induction, resistance, electrofusion welding) are described, in addition to adhesive and solvent bonding and mechanical fastening methods. Newer, emerging methods, such as laser, microwave, and infrared welding, are discussed in addition to well established methods. Section I contains textual information and graphs, tables, micrographs, photographs, and illustrations. All information is referenced; reference numbers are included in brackets following almost every paragraph. Complete citations, in numerical order, are listed in the reference index.

Section II of the book, including Chapters sixteen (16) through ninety-nine (99), covers material-specific information. It is an extensive compilation of data on the joining of particular plastics and is organized by materials. More than 80 families of plastics are represented; trade names, grades, and product forms are also included. Each chapter represents either a single generic family (i.e. polystyrene) or a specific form of a generic family (i.e. high impact polystyrene).

Data in Section II appears in textual, tabular, image, and graphical forms. Textual information is useful as it is often the only information available or the only way to provide an expansive discussion of test results. Tables and graphs provide detailed test results in a clear, concise manner. Each table, graph or figure is designed to stand alone, be easy to interpret and provide all relevant and available details of test conditions and results.

The book is organized so that joining processes and information specific to a material of interest can be found in Section II; general information about those joining processes can then be found in Section I. Information of interest can be found quickly by use of the general index, the index of figures, the index of tables, the detailed table of contents, and through sub-headings within each chapter.