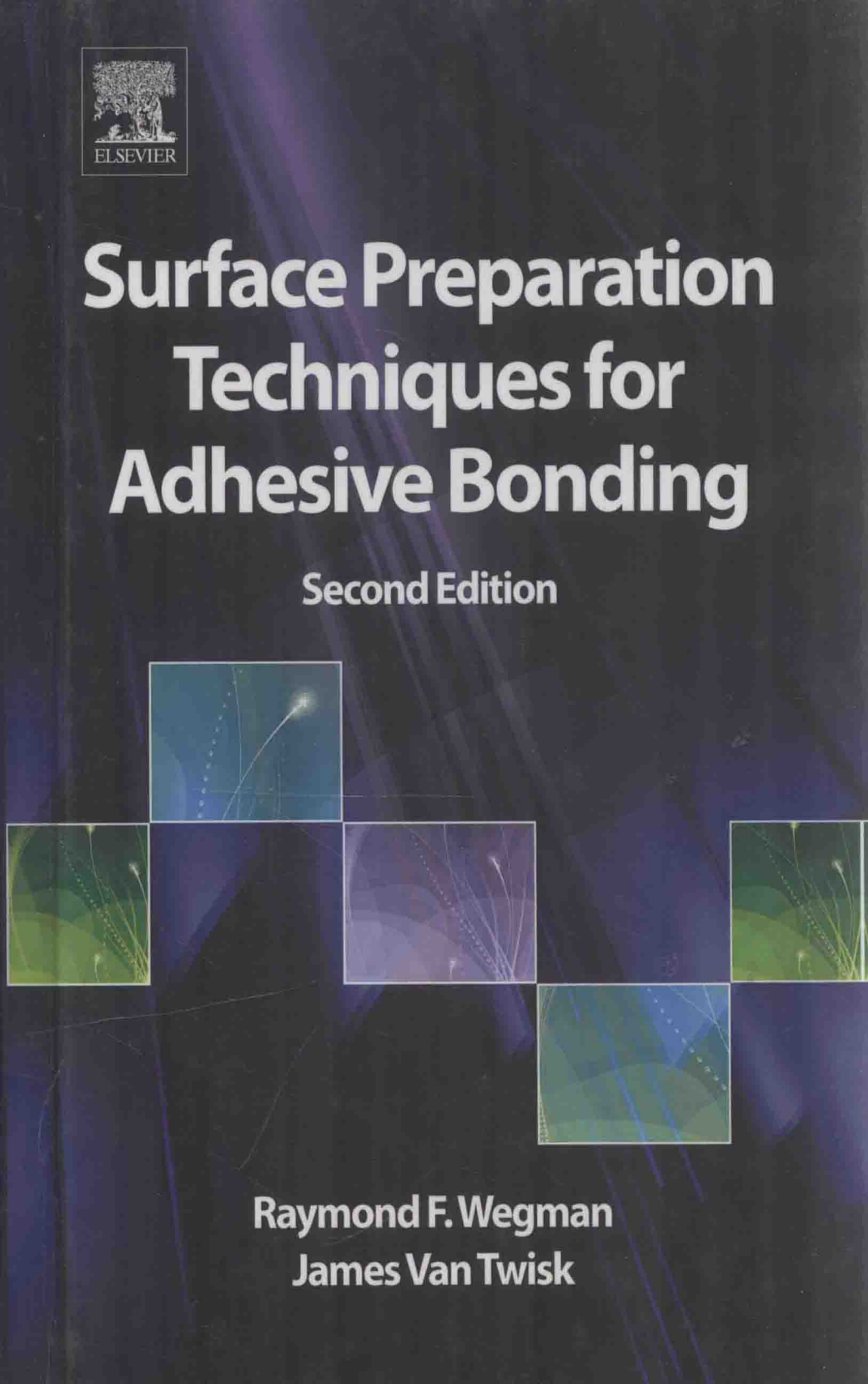
ELSEVIER
Surface Preparation Techniques for Adhesive Bonding
Second Edition
Raymond F. Wegman
James Van Twisk

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The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK
225 Wyman Street, Waltham, MA 02451, USA

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British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-1-4557-3126-8

Printed and bound in the US

12 13 14 15 16 10 9 8 7 6 5 4 3 2 1

Dedication

To all those engineers and scientists who have dedicated their careers to the advancement of the field of materials and processing for adhesive bonding; and to my wife, Rose, whose encouragement, indulgence, and sacrifice made this book possible.

Preface

The purpose of this handbook is to provide information on processing adherends prior to adhesive bonding. Where sufficient data were available the processes are given in the form of process specifications. Further, where available, data are given to provide potential users with a basis for the selection of the process most suitable for their particular application and facility.

It is known that many of the chemicals used in these processes are hazardous due to their strong oxidizing properties, or may be toxic or hazardous to one's health. It is the user's responsibility to assure that proper safety, handling and disposal procedures are implemented and monitored when any of these methods is employed.

Raymond F. Wegman

Acknowledgments

My grateful thanks to Dr. David W. Levi for his help and encouragement; Dr. John D. Venables and his staff at the Materials and Surface Science Department at Martin Marietta Laboratories, for supplying the numerous micrographs and drawings of treated surfaces.

Raymond F. Wegman

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1 Introduction

1.1 Adhesion

Adhesion is a surface phenomenon, i.e., adhesion is controlled by the condition of the surface of the adherend. The ASTM [1] defines adhesion as "the state in which two surfaces are held together by interfacial forces which consist of valence forces or interlocking actions or both." Adhesion between surfaces which are held together by valence forces is called specific adhesion; this is the same type of force which gives rise to cohesion. Cohesion is defined as the state in which particles of a single substance are held together by primary or secondary forces. As used in the field, cohesion is defined as the state in which the particles of the adhesive (or the adherend) are held together.

Adhesion between surfaces in which the adhesive holds the parts together by interlocking action is known as mechanical adhesion.

Both specific adhesion and mechanical adhesion are important to the understanding of how adhesion is affected by surface preparation. Allen [2] in his discussion of the fundamentals of adhesion concluded by stating "... an adhesive bond achieves its strength from the combination of a variety of sources; (mechanisms)... For these mechanisms, the relative importance and the proper way which they should be combined will vary from one example to another, but none should be excluded without very careful consideration and exploration."

1.1.1 Specific Adhesion

According to the theory relating to specific adhesion, this type of adhesion involves the establishment of some kind of attraction between the atoms and the molecules which make up the adhesive and the adherends. These attractions may involve primary bonding forces, which tend to be quite strong; hydrogen bonding, which yields intermediate strength; and the weaker secondary (Van der Waals) forces.

Primary bonding may be covalent or ionic in nature. Covalent bonding involves the sharing of electron pairs between adjacent atoms. Ionic or electrostatic forces are the type of primary bonds that are found in ionic crystals. Another type of primary bond is the metallic bond which is similar to the covalent bond except that it involves the valence electrons in the metal. This type of bonding is discussed by Verink [3], Wegman and Levi [4] and Salomon [5].

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