

Book review

Silane coupling agents; by Edwin P. Plueddemann, Plenum Press, New York and London, 1982, ix + 235 pages, \$37.50.

This is an excellent and timely book, providing much fundamental information to the nonspecialist and comprehensive enough to be of interest to the specialist. The author is a leading industrial researcher in this field and provides an authoritative, critical evaluation of the chemistry and technology of these commercially important materials.

Silane coupling agents (SCA) have had a profound effect upon the important development of high performance polymeric composite materials. The essential role of the SCA is to provide a stable, interactive interface between the polymer matrix and reinforcing agent to facilitate stress transfer leading to the enhanced strength characteristics desired of the composite. SCA are compounds of the generic formula X_3SiY , where X is a hydrolysable group (usually an alkoxide) and Y is an organofunctional group tailored, for reactivity or compatibility, to specific polymer systems.

The book consists of eight chapters. Chapter 1 describes the general concepts of "Coupling Agents", their definition, evaluation, nonsilane coupling agents and theories of bonding through coupling agents (51 references). Chapter 2 details the chemistry of the SCA dealing with the formation of the Si–C bond, reactions of the hydrolysable groups attached to silicon and the types and reactions of the organofunctional groups attached to silicon (66 references). Chapter 3 considers the reactions of the SCA with, and in, aqueous solutions (24 references). Chapter 4 describes the surface chemistry of the silanes at the interface with a description of the techniques used in such studies (57 references). This chapter is particularly informative for understanding the complex interface formed by the SCA. Chapter 5 discusses the nature of adhesion through SCA, with mineral surfaces and both thermosetting and thermoplastic polymer networks (51 references). The statement that systems involving thermoplastic polymers have, as yet, shown no clear evidence of chemical reactions between silane and polymer is noteworthy. Chapter 6 covers the performance data from a range of representative commercial SCA with glass fibre reinforcements, in a range of polymer systems and applications (25 references). Chapter 7 is concerned specifically with the role of SCA in particulate filled polymer composites, including rubber systems (33 references). Finally, Chapter 8 discusses a range of other applications of the SCA to produce silylated surfaces, which further demonstrate the wide versatility of the coupling agents (40 references).

The balance of chapters between fundamental aspects (Chapters 2–5) and technological aspects (Chapters 1, 6–8) is good, and the book is liberally documented with tables and graphs which are well and clearly presented. This

book will appeal to scientists and technologists in a wide range of industries and research institutions, and in view of the reasonable price represents excellent value.

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