

This article was downloaded by:

On: 21 January 2011

Access details: *Access Details: Free Access*

Publisher *Taylor & Francis*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## **The Journal of Adhesion**

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713453635>

### **Pressure-Sensitive Design, Volume 1 Pressure-Sensitive Design, Theoretical Aspects, by I. Benedek**

Krishan C. Sehgal Consultant

**To cite this Article** Sehgal Consultant, Krishan C.(2007) '**Pressure-Sensitive Design, Volume 1 Pressure-Sensitive Design, Theoretical Aspects**', *The Journal of Adhesion*, 83: 5, 509 – 511

**To link to this Article:** DOI: 10.1080/00218460701389243

**URL:** <http://dx.doi.org/10.1080/00218460701389243>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

## | Book Review

**Pressure-Sensitive Design, Volume 1 Pressure-Sensitive Design, Theoretical Aspects**, by I. Benedek. Brill Academic Publishers, Leiden, The Netherlands. (ISBN: 9067644390, Series abbreviation and number: PSD-001). List price EUR: 189.00/List price US\$: 255.00.

The book contains well-written chapters, contributed by several authors, which cover fundamental and practical aspects of pressure sensitive adhesives designed for various applications. The authors have diligently attempted to fill the gap between theory and practice, thus making the book useful for academicians and industrialists. The roles of polymer physics/chemistry, contact physics/mechanics and formulation for the design of complex PSA systems are highlighted. The theories behind the designs are explained well. Reference material is up to date although some important references in PSTC (Pressure Sensitive Adhesives Council) and ASC (Adhesives and Sealants Council) proceedings are missing.

The book has been divided into 7 chapters, which are further divided into subsections. The first chapter is introductory and has two sections, one dealing with formulation/design and the other dealing with parameters of design and formulations. It is emphasized that it is necessary to replace pressure sensitive formulation with pressure sensitive design because the former is based on the science of rheology and *practical experience*, whereas the latter is founded on rheology and the new theory of pressure-sensitivity as a *process*. Commonly known parameters of design, such as glass transition temperature,  $T_g$ , modulus of elasticity, molecular weight/distribution, and compatibility are covered in some detail. A good feature is that the role of these parameters in application conditions during manufacture, an important step for the development of the final product, is also pointed out.

The second chapter touches on the application of well-known theories of adhesion to PSAs. Reference is made to such terms as phenomenon, property and the process. The former is considered as a conjunction of the latter two. The terms adhesion and adherence are attributed to the formation and the rupture of the bond, respectively.

Pressure Sensitive Adhesion is considered as a three stage process: formation (bonding), relaxation, and rupture (debonding) with the

description of the contributions of well-known interfacial and rheological properties. Explanations of different stages of bonding, relaxation, and debonding are given. The second term, "relaxation," is claimed to be a new additional term for understanding PS adhesion. However, this term is the same as the "dwell time," which is usually referred to in PSA literature and has been used in industry for a long time. An interesting comment and explanation is made of the Dahlquist criterion of tack, which is not obeyed by a PVP-PEG adhesive. The chapter is more of academic interest and can serve as good reading material for understanding PS adhesion.

The third chapter deals with the role of design and formulation parameters for producing PSA products. Product components such as carrier, liner, and adhesive type (synthesis aspect is covered in the next chapter), and manufacturing components such as adhesive coating and plastic manufacturing, are covered in some detail. A useful table summarizing the principles and technology of PS products is included. Influence of different design and formulation parameters involved in the PS product manufacture are well described. These include equipment-related and productivity-related design and formulation, environmental considerations, choice of the adhesive manufacturing and processing technology, coatability of adhesive, drying, running speed, converting properties, dimensional stability, and confectionating properties. Details are also provided on factors involving adhesives and formulation types for producing PS products for various applications. The term "global technology" is used to encompass various design parameters. Finally, mention is made of the theoretical and economic limits of design and formulations.

This chapter is well written and should interest academicians and industrialists. The chapter could have been shorter, for easy reading, by avoiding some material repeated in the fourth chapter.

The fourth chapter appears to be the best part of the book. The chapter deals with the principles of pressure sensitive design and formulation in relation to the role of the adhesive, although some components of this are also mentioned in the previous chapter. A thorough coverage of the synthesis and formulation parameters of PSAs intended for various permanent and removable adhesives for different applications is done. This provides a good component of structure-property relationship for synthesis parameters like the type of polymerization process, initiator, monomer chemistry/polarity/functionality, stabilizing system. The effects of these on  $T_g$ , molecular weight, particle size, hydrophobicity/hydrophilicity, crosslinking, grafting and subsequent effects on performance properties are very well explained. Description of formulation parameters such as tackifiers, plasticizers,

homogeneous/heterogeneous blending agents, crosslinkers, dispersants and fillers to suit a given end use application is given. A good literature survey is given, although some of the references of papers regarding structure-property relationship that appeared in the PSTC proceedings are missing.

The fifth chapter lists the performance properties—tack, peel and shear—along with the testing parameters. Different methods (rolling ball, loop and probe) used to measure tack along with the test type and polymer parameters affecting the property are explained. By the same token, the peel test is covered and data on the peel strength using various test types for permanent and removable PSAs are given. Shear strength is also covered well and the dominant effect of viscoelastic properties is highlighted.

The sixth chapter explores the possibilities of using water-soluble polymers for PSA applications such as water-soluble splicing tapes, labels, medical OPP tapes, and biomedical electrodes. The emphasis is on the repulpable PSAs. Also, the type of synthesis process and its ingredients, crosslinkers, plasticizers and other blending agents used for developing these polymers and their performance characteristics and testing are covered.

The last chapter, the seventh chapter, describes the hydrocolloid formulations based on a nanocomposite approach and their use in medical and cosmetic applications, particularly the wound care market. All hydrocolloids are considered to consist of a hydrophobic matrix and hydrophilic disperse phase. The general design approaches for their preparation and the development of new formulations are described in detail. The technical requirements for this class of adhesives are also well covered.

The book can be a good addition on the shelf of industrialists and academicians interested in Pressure Sensitive Adhesives development and research.

Krishan C. Sehgal, Ph.D.  
Consultant  
4720 Sharpstone Lane  
Raleigh, NC 27615, USA  
E-mail: kcsehgal@nc.rr.com