

COURSE OUTLINE: GENERAL OVERVIEW OF ADHESION SCIENCE

Duration: Two days

DESCRIPTION: Adhesion plays an important role in many technologies and industries, viz., automotive, thin films, optics, coatings, paint and so on. Broadly speaking, the topic can be divided into two categories: film or coating /substrate combination, and adhesive joint. Films and coating are used for a variety of purposes and irrespective of their intended function, these must adhere adequately to the underlying substrate. So the need for understanding and controlling the factors affecting adhesion is quite patent. Also the durability of the bond (on exposure to process chemicals, moisture, corrosives, etc.) is of grave concern and importance.

This two-day course provides up-to-date information on the factors affecting adhesion and various ways to enhance adhesion in a host of situations.

WHO SHOULD TAKE THIS COURSE:

Research, development and manufacturing personnel who have a current or anticipated need for a thorough knowledge of adhesion science and technology.

WHAT ARE YOU TAUGHT:

After completing this course, you should be able to:

1. Select the right surface cleaning technique Utilize the concept of acid-base interactions in improving adhesion
2. Analyze the alternatives and select the optimum technique for improving adhesion, and hopefully, the durability.
3. Select the appropriate adhesion measurement technique.
4. Know what are the latest developments and where to look for more information.

TOPICS TO BE COVERED

SURFACE CONTAMINATION AND CLEANING

5. Various Cleaning Techniques
6. Characterization of Cleanliness
7. Importance of Cleanliness in Adhesion
8. Storage of Clean Parts

THEORIES OR MECHANISMS OF ADHESION

1. Various theories:
 - a. Mechanical
 - b. Surface
 - c. Energetics
 - d. Diffusion
 - e. Electrostatic
 - f. Chemical:
 - i. Acid-Base, and Weak Boundary Layer) with their Relative Validity and Usefulness.
 - g. Special Consideration of Acid-Base Concepts in Adhesion

CONTACT ANGLE, WETTABILITY AND ADHESION

1. Contact Angle Measurement and Factors Affecting it
2. Determination of Surface Free Energy of Polymers
3. Relevance of Wettability and Surface Energetics in Adhesion

INVESTIGATION OF INTERFACIAL INTERACTIONS

1. Application of ESCA in Unraveling Events at an Interface

SURFACE MODIFICATION TECHNIQUES AND OTHER WAYS TO IMPROVE ADHESION OF ORGANIC COATINGS

1. Various Surface Modification Techniques
 - a. (e.g., Plasma, Flame, Corona, Laser, UV, Ozone, Wet)
2. Other Ways to Improve Adhesion
3. Factors Affecting Adhesion of Organic Coatings
4. Stresses in Coatings and Their Relevance to Adhesion

SILANES AND OTHER ADHESION PROMOTERS

1. Various Aspects of Silane Adhesion Promoters; How to Apply Them and Where to Apply Them?
 - a. Examples of Adhesion
 - b. Improvement by Use of Silanes
 - c. Non-Silane Adhesion Promoters

ADHESION ASPECTS OF THIN FILMS

1. Various Mechanisms of Adhesion of Thin Films
2. Factors Affecting Adhesion of Thin Films and Ways to Improve Adhesion
3. (Note: Metallized Plastics and Cases of Other Thin Films on a Variety of Substrates will be Discussed)

ADHESION MEASUREMENT OF FILMS AND COATINGS

1. Concept of Practical Adhesion
2. Various Techniques (Ranging from Simple to Sophisticated) for Measuring
3. Adhesion with Their Potentialities and Limitations

CONTACT INFORMATION

Dr. K. L. Mittal
1983 Route 52, Suite C
P.O. Box 1280
Hopewell Junction, NY 12533-1280

Tel. 845-897-1654
FAX: 845-897-2361
E-mail: klm@mstconf.com



SHORT COURSE ON ADHESION MEASUREMENT METHODS

This course is designed to mesh with the MST symposia by presenting an overview of the latest adhesion measurement techniques which are being used to evaluate the PRACTICAL ADHESION of coatings. Emphasis will be given to methods which can be carried out in a manufacturing environment as well as in the lab and which give results that are directly relevant to the durability and performance of the coatings. The effects of coating elastic properties and residual stress are considered as well as other external influences which affect coating adhesion.

TOPICS INCLUDE:

- ▶ **Historical overview and background.**
- ▶ **Basics of adhesion measurement:**
 - a. **Qualitative methods**
 - b. **Semi-quantitative methods**
 - c. **Fully quantitative methods**
- ▶ **Role of residual stress and material mechanical properties on adhesion:**
 - a. **Effect of coating and substrate elastic properties**
 - b. **Effect of residual stress**
- ▶ **Problem of setting adhesion requirements for coating applications:**
 - a. **What is a sufficient level of adhesion strength?**
 - b. **Avoid over-specifying adhesion requirements to the detriment of other product requirements.**
 - c. **Problem of long-term environmental degradation.**

Audience: Scientists and professional staff in R&D, manufacturing, processing, quality control/reliability involved with adhesion aspects of coatings and adhesion sensitive applications.

Level: Beginner- Intermediate introduction/overview

Prerequisites: Elementary background in chemistry, physics or materials science.

Duration: 1 day

How You Will Benefit From This Course:

- ▶ **Understand advantages and disadvantages of a range of adhesion measurement techniques.**
- ▶ **Learn optimal methods for setting adhesion strength requirements for coating applications.**
- ▶ **Learn how to select best measurement technique for a given application.**

Contact Information

**Dr. R. H. Lacombe, Conf. Chair.
3 Hammer Drive
Hopewell Junction, NY 12533**

FAX: 212-656-1016

Phone: 845-227-7026, 845-897-1654

E-mail: rhlacombe@compuserve.com