

# Comprehensive Short Course Adhesion Measurement Methods

Danbury Connecticut  
June 25, 2011



This course presents an overview of the latest adhesion measurement techniques which are being used to evaluate the **PRACTICAL ADHESION** of coatings and laminate structures. Emphasis is 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 structures under investigation. The effects of coating elastic properties and residual stress are considered as well as other external influences which affect durability under use conditions.

**Audience:** Scientists, technicians 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

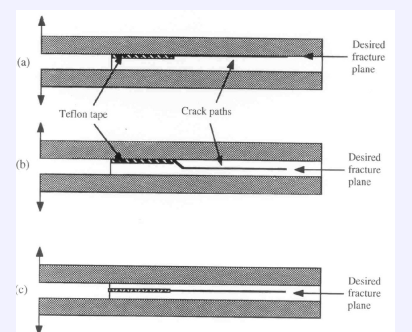
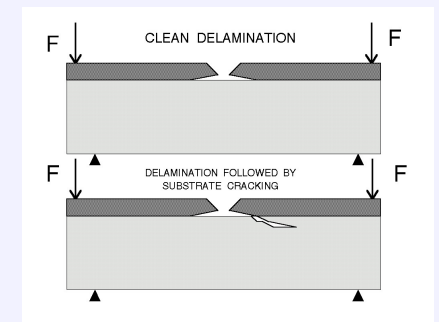
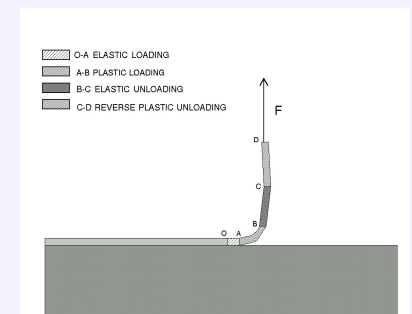
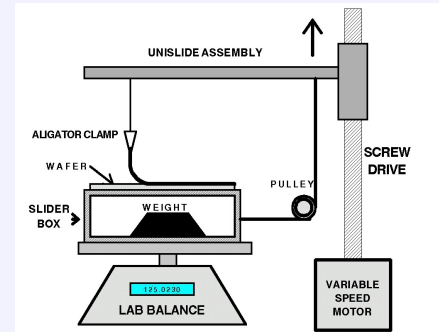
**Prerequisites:** Elementary background In chemistry, physics or materials science.

**Duration:** 1 day

**Course fee and materials:** \$695; Includes complete set of lecture notes plus copy of handbook and reference guide **ADHESION MEASUREMENT METHODS: THEORY AND PRACTICE, (CRC PRESS, 2006)**

## How You Will Benefit From This Course:

- ▶ Understand advantages and disadvantages of a range of adhesion measurement techniques.
- ▶ Gain broad overview of wide range of adhesion measurement methods
- ▶ Learn optimal methods for setting adhesion strength requirements for coating applications.
- ▶ Acquire basic skills for addressing adhesion failure problems
- ▶ Know where help is available in emergency situations
- ▶ Learn how to select best measurement technique for a given application.



## CONTACT INFORMATION

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**Register for next scheduled session:**

[www.mstconf.com/RegMST.htm](http://www.mstconf.com/RegMST.htm)

## TOPICS INCLUDE:

- **Basics of adhesion measurement:**
  - Qualitative methods
  - Semi-quantitative methods
  - Fully quantitative methods
- **Role of residual stress and material mechanical properties on adhesion:**
  - Effect of coating and substrate elastic and material properties
  - Effect of residual stress
  - Continuum theory
  - Fracture mechanics of adhesion
- **Problem of setting adhesion requirements for coating applications:**
  - What is a sufficient level of adhesion strength?
  - Avoid over-specifying adhesion requirements to the detriment of other product requirements.
  - Problem of long-term environmental degradation.
  - Method of stability maps
- **Adhesion measurement at atomic and molecular level (fundamental adhesion):**
  - Surface force apparatus
  - Atomic force microscope
  - Hamaker theory
  - Particle adhesion, JKR theory
  - Contact angle behavior
- **Applications:**
  - Setting quality control specifications
  - Determining best measurement for given application
  - Provide data base for product engineering design work
  - Support new product research and development
    - Identify and eliminate potential failure modes early in development cycle
  - Enable rapid effective response to unforeseen failure mechanisms

## COURSE INSTRUCTOR

Dr. Lacombe received his PhD. degree in Macromolecular Science from Case Western Reserve University and was a postdoctoral fellow at the University of Massachusetts working on problems of polymer solution thermodynamics. He was an IBM senior level engineer/physicist for 17 years working on hybrid non-intrusive inspection and evaluation techniques, as well as problems of materials compatibility of both semiconductor and microelectronic packaging devices. He is an expert in the area of stress buildup in laminate structures and using the techniques of fracture mechanics in solving problems of delamination and cracking in composite devices. He has been a leader in the areas of materials characterization having published some of the first mechanical response data on monolayer nanostructures in the early 1980's. In addition, he has pioneered innovative uses of large scale computation using finite element methods and has applied this expertise directly to problems affecting product development and manufacturing. He is credited with over 40 publications and patents.

Post IBM Dr. Lacombe worked for a small startup company doing contract work for the state of New York on diamond coatings in the energy industry and for the US Navy on problems of subsurface nondestructive inspection of aircraft parts and worked on innovative technologies in the field of subsurface inspection methods dealing with flaws in structural parts of aircraft, auto, marine and aerospace vehicles.

Since 1999 Dr. Lacombe has been Chairman of MST Conferences and has collaborated in the organization of over 50 international symposia. The course material reflects the integration of over 40 years experience with materials science and design engineering focusing on practical product development.

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