Chemsultants International
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The Chemmunicator

Welcome to this issue of ***The Chemmunicator,*** a quarterly publication of Chemsultants and ChemInstruments.

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Chemsultants implements a new ISO Quality Management System for Product and Process Operations

by Joe Mausar

Chemsultants is pleased to announce a new ***Product and Process Operations Quality Program*** to better direct the overall quality management of its Pilot and Contract Coating operations.

The Program has been formulated to be consistent with the requirements of International Standards:

ISO 9001:2008

ISO 13485:2003 for medical devices

U.S. Food and Drug Administration Quality System Regulation (QSR) for Current Good Manufacturing Practices (cGMP): 21CFR 800.

A partial list of the objectives of the new Quality Policy includes:

- To consistently provide products and services that meets or exceeds the requirements and expectations of our customers.
- Actively pursue ever improving quality through programs that enable each employee to do their job right the first time and every time.
- To continually improve its operations to eliminate defects and non-conformances whether as part of product or process development coating programs.

This total Quality Management System will help to insure that all manufacturing operations are focused on a consistently high level of quality. Chemsultants has implemented the program to better serve the needs of medical device, pharmaceutical, and electronics customers as well as to provide an improved level of service to our industrial coating customers.

Precision Hand Proofers provide the ability to produce reliable, production-like ink coatings on a laboratory scale by Brian Bresser

ChemInstruments is proud to provide the full line of HarperScientific Precision Hand Proofers for the printing industry.


Traditional Echocel Junior™

HarperScientific™ is the Printing and Coatings Supplies Division of Harper Corporation of America. As a leader in the precision proofing market, HarperScientific™ manufactures a full line of precision proofers for printers all over the world.

Hand proofers provide the ability to produce reliable, production - like coatings on a laboratory scale. All HarperScientific™ proofers use HarperScientific's Platinum® XLT™ laser-engraved Anilox rolls. With HarperScientific's doctor blade metering and rubber transfer roll, you can accurately match colors and produce precision coating samples in your lab.


Phantom™ Proofer

Pioneers of the patented "Echocel Junior™" precision hand proofer, HarperScientific™ was instrumental in developing a simulation of the printing press by manufacturing proofers with laser-engraved ceramic anilox rolls with doctor blade metering. This technology enables the user to draw down the exact color with a hand-held instrument. Our latest development is the Phantom™ hand proofer which offers many benefits with great results.

HarperScientific™ specializes in flexographic and gravure hand-proofing systems for water, solvent and UV systems, which incorporate XLT™ laser-engraved ceramic anilox rolls with doctor blades. These hand proofers include anilox volume ranges of 1.3 - 20.0 BCM, as well as both 60- and 30-degree hexagonal engraving. They also are available with single and banded anilox rolls.

HarperScientific™ proofers are used in the flexo, offset and gravure industries, as well as all OEM markets with printing presses. This includes supplies for various inks and adhesives and coatings, including water-, solvent- and UV-ink markets.

For more information on hand proofers please visit our website at –

http://www.chemsultants.com/testing-equipment-products/sample-preparation-devices/hand-proofers.aspx

Tack: Three methods of measuring this key PSA property by Joe Mausar

Pressure sensitive adhesives (PSAs) are usually described as having three basic performance properties: ***tack, peel adhesion, and shear resistance*.**

Unlike peel adhesion and shear resistance, the concept of tack is difficult to define. In the PSA industry it has been called by many different names including tack, wet grab, quick stick, initial adhesion, finger tack, thumbtack, quick grab, quick adhesion, and wettability. Tack is one of the most important properties of PSAs defined as the ability of an adhesive to form a bond of measurable strength to another material under conditions of low contact pressure and short contact time.

The Pressure Sensitive Tape Council (PSTC) defines tack as "that which allows a pressure sensitive adhesive to adhere to a surface under very slight pressure." The American Society for Testing and Materials (ASTM) defines tack as "the force required to separate an adherend and an adhesive at the interface shortly after they have been brought rapidly into contact under light load of short duration." However, it is not clear how long "short duration" is and how much load "slight" or "light" is.

Tack is not simply a stand alone adhesive property; it also depends on the adherend properties and the test conditions used when measuring the property. That is, tack is sensitive to a wide range of factors, such as the type of adhesive, contact pressure during bonding, dwell time prior to debonding, adherend, test speed, temperature, humidity, and the adhesive's flow characteristics. Due to the interaction of these variables, it is hard to describe tack by a single, unified theory.

The various methods of measuring tack all include the contact of two surfaces (adhesive and test substrate) under light pressure for a short time, followed by a separation step, the force (or energy) of separation being taken as a measure of tack. Thus, the procedure for measuring tack is a two-stage process of bond formation and bond separation. During bond formation, contact in molecular dimensions between the adhesive and the adherend is established in isolated spots of the geometric contact area, the number and size of which increase with contact time by deformation and flow as well as by wetting. The bonding process is not completely understood in a quantitative sense, but, quantitatively it is assumed that good bonding is achieved if the adhesive has the following properties:

- Ability to wet the adherend, which implies that the surface energy of the adhesive must be less than that of the adherend;
- Low viscosity in terms of small shear displacements of polymer chain segments, but not necessarily at large displacements;
- Relaxation times of elastic deformation which are substantially less than the time of contact;
- Low elastic modulus and high deformability to permit conformation to the contour of the surface.

The second step, bond separation under the influence of external forces at a certain rate, is connected with deformation of the adhesive joint and the creation of two new surfaces under destruction of the interface. Control of tack is important so that the right level of initial bond strength is achieved. If the tack is too low, then the bond may rupture during manufacture, or if the tack is too high, then repositioning of substrates may be difficult. Tack is normally determined from the force required to separate two components joined by a soft viscoelastic bonding material (pressure sensitive adhesive). Tack gives an indication of how quickly an adhesive can wet and make intimate contact with a surface. That is, high tack forces on separation are associated with effective wetting of the surface.

Numerous standard tack test methods have been developed for PSAs by different organizations. They can be divided into three broad categories: those using a rolling ball, those using a modification of the peel test, and those using some form of probe. However, the results produced by different techniques

are not always comparable. It is thought that some of these differences may be due to the viscoelastic response of the adhesive, since dwell times and separation rates vary between test methods.

The standard tack test methods fall into the following three categories:

Rolling Ball Tack Test

The rolling ball test has been the oldest and most widely used for at least 50 years. In the common form of the rolling ball tack test, a stainless steel ball with 1.1cm (7/16 in.) diameter is released at an elevation on an inclined ramp so as to roll down and at the bottom of the ramp come into contact with the horizontal, upward-facing adhesive.

The distance the ball travels out along the adhesive coated surface is measured as tack. It is primarily intended for quality control of adhesive tapes, but may also be used to investigate adhesive coatings. Since the motion of the ball is closely related to bonding and debonding processes which occur simultaneously at the surface of contact, it is believed that the rolling motion of the ball on a pressure sensitive adhesive reflects tackiness of the adhesive.

However, the Rolling Ball Tack test does not provide the level of control needed to understand tack, since the rate of application of the force varies somewhat as the ball travels the length of the tape.

Loop Tack Test

A modifications of the peel test for tack determination is the Loop Tack test. In the loop tack test, a loop of psa coated material (adhesive side out) such as a label or tape is attached to the jaws of a Loop Tack tester or a tensile testing machine with a special test fixture.

The loop is brought into contact with the test panel by lowering the loop at a specified rate till it contacts a certain area (usually 1 square inch) of the test panel. The testing machine is then reversed and the force to remove the tape is recorded as tack.

The steps involved in the test, which are:

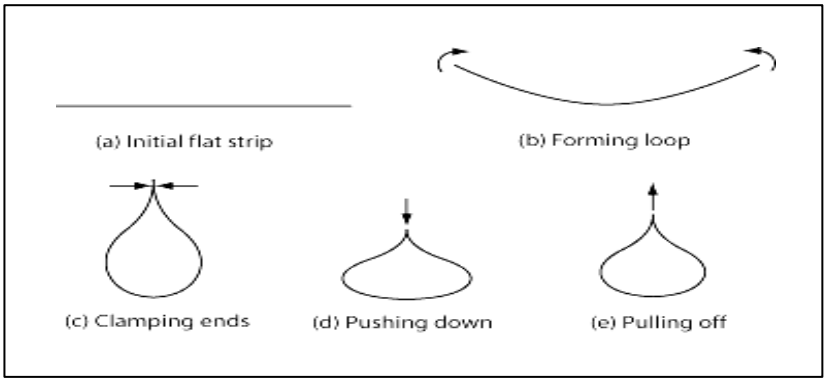
Step a: Initial flat strip

Step b: Form the loop from the tape. The specified length of tape should be bent back until around 10mm or so of the ends are in contact. The adhesive surface should be on the outer surface.

Step c: Clamp the loop in the movable test machine grips. The formed loop should be connected to a load measuring device with sufficient range and sensitivity (normally specified in the test method). The loop should be aligned such that the edges of the tape will be at a right angle to the edge of the base plate.

Step d: Lower the loop. The loop should be lowered, pushing down onto the test panel surface, until the adhesive makes contact over the required area. Although the standard test methods do not require it, measurement of the 'push down force' can help check for consistency among different tapes.

Step e: Retract the loop pulling it off the test panel surface



Once the loop has contacted the required area of the base plate, the direction of the test machine is reversed. The area in contact should be inspected visually for any imperfections in the contact (e.g., wrinkles or bubbles). The test should run until the tape is detached from the plate. The pulling force versus top displacement of the loop is recorded.

Loop tack tests have the advantage of requiring only simple fixtures mounted on standard Loop Tack or tensile testers, being quite easy to carry out, and being acceptably reproducible. Even in a single test, however, they are subject to variable peel angles and contact times.

Probe Tack Test

The Probe Tack test is a mechanical simulation of the old thumb or finger tack tests. In the test, the tip of the clean probe with a defined surface roughness is brought into contact with a supported pressure sensitive adhesive under low contact pressures for a short time and then pulled away at a fixed rate, during which the peak force of separation is measured. The force required to pull the probe away from the adhesive at fixed rate is recorded as tack (expressed in grams).

In this test method, the effect of the material backing is eliminated because the tape is rigidly mounted on an annular ring of known weight. The test can be used for quality control or research purposes.

Summary

The three recognized test methods for measuring the tack of a pressure sensitive, other adhesive type or polymer material are well recognized and established. Choosing the most appropriate method can be somewhat of a task. The table below should help.

Test Type	Test Methods	Strengths	Weaknesses	Comments
Rolling Ball Tack	ASTM 3121	Easy and inexpensive to test perform.	Difficult to translate distance traveled by the ball to a force value.	A true comparative tack method best suited for QA use.
Loop Tack	ASTM D6195 PSTC 16 TLMI L1B1 TLMI L1B2	Controlled rate of bonding, dwell time and debonding speeds. Can be performed on a dedicated Loop Tack tester or a tensile tester w/fixture.	The label facestock or tape carrier can affect the debonding force / tack can lead to variable results.	Best suited for thin, flexible labels and tapes.
Probe Tack	ASTM D 2979	Controlled rate of bonding, dwell time and debonding speeds. Most reproducible tack test method.	Requires a specific, dedicated Polyken™ Probe Tack tester.	Best suited for thicker, more rigid labels and tapes.