Selig flexibles

Protect, Seal and Deliver

Safe Packaging Materials

for your products

Laboratory technology and flexible packaging

The success of our publication “First Aid for questions concerning flexible packaging” which provided information about various material properties led to a logical continuation. The present folder “Safe Packaging Materials for your Products” offers details about the most important analytical methods, their usefulness for you and the necessary instruments.

You won’t be surprised to learn that these instruments are all part of our laboratory equipment and at your disposal for use in your projects. We made large investments in our development lab, because only the specific employment of techology equipment makes a scientifically based packaging evaluation possible. This not only achieves more precise, but also faster results.

Of course, besides the most modern instruments you need highly qualified specialists, too. These specialists look forward to sharing their experience with you. Contact us to discuss your flexible packaging projects.

Slip Properties

How fast and well a given material can be processed on your machines is largely dependent on its slip properties. These are shown by the COF (Coefficient of Friction).

The side of the film coming into contact with the critical parts of your machine (e.g. the shoulder) is placed on a predefined metal plate and a section of the film pulled across it. The measuring instrument calculates the power needed.

A standardized sample is pulled over a certain distance at a predefined speed and load. Simultaneously a load cell measures the force needed. The built-in computer calculates the friction coefficient by the formula “Tensile Force (N) divided by Sledge Pressure (N)”. The result is dimensionless (no unit). The lower the value, the better the glide of the material.

This is the same way both the film on film friction and the film on metal friction can be measured. For specific machine types, the COF is of the highest importance. We principally specify it for all internal materials.

Surface Properties

The outer surface of our products comes into contact with your product and your machines. Whereas the “inner values” of a packaging material have to be chosen to comply with the protective demands of your product, the surface of the material has to fulfil a far wider range of requirements.

Our Fourier Transmission Infrared Spectrometer (FT-IR) identifies a material by analyzing its surface - by its “finger print”, so to speak. Moreover, it will find minute traces of additives or contaminations. The analysis penetrates to about 2 micron deep into the material.

Molecules are able to absorb IR-radiation of certain wavelengths. This energy uptake can be registered by the FT-IR. The signal is rendered as “% Transmission” (permeability). Since molecules always absorb energy at the same IR-wavelengths, it is possible to identify the specific molecule. The registered signal is compared to a large data file of known spectrums and interpreted. A specialist can thus qualitatively identify the various substances. The IR assists in the development of a new packaging material as well as in routine quality control.

Bond Strength

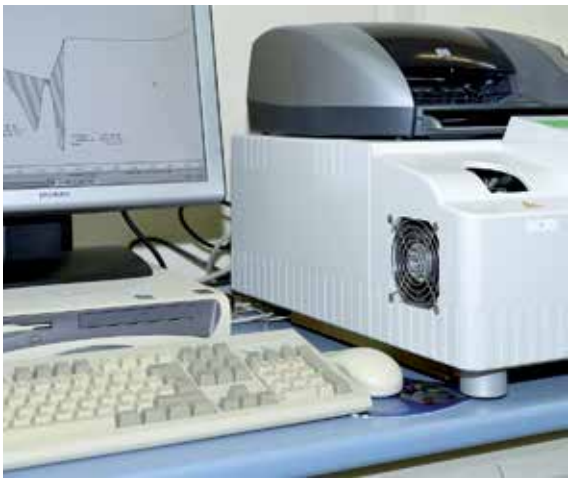
The adhesion of the several layers is an important mark of the quality in laminates. If insufficient, de-lamination (separation of the layers) can take place. To avoid this, we measure the bond strength of each production several times.

The tensile machine used for this is a comparatively simple instrument. The sample is fastened between two clamps which are electrically drawn apart. Thus the layers of the sample are separated as the adhesion strength is recorded exactly.

At a predefined speed the necessary force to separate or to tear a sample is measured. The load cell built into the upper part of the instrument measures the resistance (in Newtons) of the sample in this procedure. The final result is rendered as force/width. The customary width in Switzerland is 15 mm and has always to be taken into account when comparing different bond strength values. Other widths can be simply calculated proportionally.

Composition of Materials

Often it is not only the surface or the layers of a material which determine its properties during your production. For example, the important hot-tack of a polyethylene is largely determined by the mixing ratio of a LDPE to a LLDPE resin. If this is known, the sealing properties of a given material can be optimised.



The Differential Scanning Calorimeter (DSC) analyses the thermal behaviour of a material over its total mass, i.e. the total thickness. It cannot provide any information about the surface of a material, but it determines the percentages in its composition very accurately.

The DSC analyses the heat exchange processes of partially crystalline materials while heating the samples together with a blank reference at a constant heating rate. As soon as a change in the heat exchange occurs in the sample, this is registered as a peak on a diagram. An upwards peak (release of heat) signifies an exothermic, a downwards peak (intake of heat) an endothermic reaction. The peak temperature as well as the standardised heat (J/g) of the respective actions provide information about the type of plastic.

However, the DSC can only be used successfully by an operator who is well versed in the interpretation of the measuring results.

Composition of Layers

Many raw materials consist of several layers. Often the combination of various raw materials in one laminate forms a structure of ten or more different layers. Only if all layers are known and controllable, a laminate can be perfected.

Our Microtome cuts wafer-thin samples out of a compound which then can be analysed under a special microscope with regards to their composition. The resolution of this high-performance instrument allows for the recognition of the finest layers of ink and glue.

The respective sample is first fixed in a plastic mould. This is done by combining a liquid resin with a curing agent. The resulting mixture is poured over the sample. After the hardening of the resin the sample can now be mounted into the Microtome. That way you can cut extremely thin samples even out of soft substances. These are then fixed to a specimen slide and analysed under the microscope which works with polarized light and is equipped with a camera and a video printer.

Residual Solvents

Solvents used in inks and glues have to be eliminated from the packaging material. Only very few milligrammes may remain. Otherwise there is a danger of your product taking on the aroma of the solvent. Not only is the amount of solvents a concern, but their composition as well.

The Gas Chromatography (GC) analyses the residual solvents in a sample and shows their separate components. We analyse each production containing solvents in our GC to verify that they remain under the predetermined limits.

A sample is heated to 120°C for 15 min. The “mixture” of solvents thus released is injected into a capillary column. With the help of a carrier gas it is driven through a special material on which the separate components of this “cocktail” precipitate for a certain time. The time it takes until the carrier gas carries these components onwards identifies them. The analysis of the GC is done by looking at peaks in a diagram: their position on the time-line (retention time) identifies the solvents, the area below their curve shows the amount of this component. However, a GC can only identify the solvents it has been calibrated for beforehand.

Food Safety

The observance of the applicable food safety laws is imperative for every manufacturing company using materials which come into direct contact with food stuffs. This is especially important for the raw materials used and their ingredients.

Since the transfer of substances from the packaging material onto the contents has to be reduced to a minimum, the law prescribes values for specific as well as global migration. The mandatory migration limits have to be checked regularly so that the absolute compliance of the packaging material to the applicable food regulations can be guaranteed. The identification and quantification of so called NIASs ("Not Intentionally Added Substances") is a further step towards comprehensive food safety.

Global Migration

When testing global migration it has to be made sure that the total amount of substances which can be extracted out of a given packaging material with the help of certain food simulants does not exceed the value of 10 mg/dm² (EU-guideline 10/2011).

The following simulants are used respectively: olive oils as a simulant for fatty, ethanol 10% for aqueous, acetic acid 3% for acidic, ethanol 50% for alcoholic and Tenax™ for dry foods.

Depending on the type of food that has to be simulated (dry, fatty, acidic, aqueous, alcoholic) the suitable simulant is used for global migration. After 10 days at 40°C the amount of migrant in the simulant is measured. Using the conversion factor 6 dm²/kg (Euro cube), the resulting value (at mg/kg) is then calculated at mg/dm².

Specific Migration

Plastic films may only contain substances which are listed in the FCM-list of the EU-guideline 10/2011. The FCM-list states for each substance the limit which must not be exceeded in the migration testing. The measurement of the amount of migrant requires accurate analytical instruments. A GC/FID is best suited for this, and a large number of substances can be tested.

NIAS

The identification of so-called NIASs ("Not Intentionally Added Substances") completes the check of food safety with regards to migrating substances. Since these are substances which cannot be predicted before testing, they cannot be measured with the GC/FID because the instrument is not calibrated for their identification. However, a GC/MS (Gas Chromatograph/Mass Spectrometer) is ideal to identify such unexpected matter. The MS can identify substances 1:1, and the combined GC can then quantify their amounts.

Laboratory Equipment

1. Headspace Gas Chromatograph for measuring residual solvents
2. Differential Scanning Calorimeter (DSC) for measuring thermal properties
3. Gas Chromatograph (GC) for migration testing (with Mass Spectrometer [MS])
4. Zwick Tensile Testing Machine for testing tensile strength, bond strength, seal strength and friction coefficient
5. Manual lamination machine
6. Fourier Transmission Infrared Spectrometer (FT-IR)
7. Microtome
8. Vacuum sealing tester
9. Digital lid closing torque meter
10. Induction sealing instruments
11. Torque tester
12. Ovens

Selig Switzerland Ltd.
Bahnhofstrasse 13
8172 Niederglatt, Switzerland
Tel. +41 (0) 44 851 50 50 | Fax +41 (0) 44 851 50 51
www.SeligFlexibles.com | info@SeligGroup.com

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