

Heat Seal Lacquers

For the Packaging Market

Description

Heat-sealing is the state-of-the-art method of choice to achieve hermetic closure of packages, by applying heat and pressure for a well-defined time frame to two substrates. The heat-sealing process has been extensively used for packaging on a wide variety of items, in particular for blisters and food packaging.

Lidding Packaging

Lidding films are used widely in the dairy and food sector. They are designed to seal and peel from different materials such as polypropylene (PP), polystyrene (PS), PET and paper. As a lidding material, aluminium provides particular benefits, making it very appropriate for use on multiple product types. It provides an impermeable barrier against water vapour and oxygen transmission, and blocks light and aroma, making it suitable for sensitive products or those which require a longer shelf life. Aluminium lids with a heat-seal lacquer are mainly used for products such as yogurt, butter and creams.



Figure 1: Yogurt pot with aluminium

Mixpap technology is an alternative to aluminium lidding for dairy products and is based on coated paper and PET. These lids maintain freshness and provide attractive qualities to the product. Mixpap can be sealed to PS, PP, PET and PVC. Lidding films also find use in the food

packaging industry for ready meals and fresh food in trays. In this case the main film used is PET and it is heat-sealed against trays, mainly PET trays.

Blisters

Blister pack is a general term used to describe several types of pre-formed plastic packaging used for small consumer goods, foods and pharmaceuticals. The primary component of a blister pack is a cavity or pocket made from a formable web, usually a thermoformed plastic, which usually has a backing of paperboard or a lidding seal of aluminium foil or plastic. Depending on the final application market, the heat-seal blister packaging is typically made of PVC and PET materials.

Pharmaceutical Blisters

Packaging is an essential part of the drug delivery system and blister packs have been selected by the pharmaceutical industry. The primary advantage of blister packaging is the protection of the product from physical and mechanical damage, degradation and biological contamination, as well as from any external factor that might influence the properties of the product. In addition, the product is clearly visible with this type of packaging, it is simple to manufacture at high volumes and velocities and it is easy to extract the capsule by merely pressing the blister. In the case of blister packs, the heat-sealing lacquer is applied on the matt and glossy side of an aluminium film (20 μ) and it is sealed against PVC.



Carded Blister Packaging

Another type of blister pack consists of carded packaging in which products such as toys or electrical items are contained between a specially made paperboard card and transparent pre-formed rigid PET, as illustrated in Figure 3. By using clear plastic, the user can easily examine the product, while the coated back card helps the marketing and advertising. The adhesive is strong enough to maintain the pack, but weak enough to open the package easily.



Figure 2: Carded

Typical Properties

Lubrizol Advanced Materials has developed Heat Seal Lacquers for the Packaging market for many years focusing the development in the end use properties.

Product	pH	% Solids	Viscosity (cps)	Tg (°C)	Market
Hycar 26084	5.9	49.4	80	18	PET Lidding for Trays
Hycar 26138	6.0	49.0	50	32	Carded Blister
Hycar FF26916	8.2	49.5	88	1	PET Lidding for Trays
Carbobond 3005E	8.2	47.6	382	1	Pharmaceutical Blisters
Carboset GA7182	7.5	39.4	33	50	Carded Blister
Carboset GA7424	8.5	49.0	830	11	Carded Blister
Carboset GA7436	8.5	48.7	720	-5	Carded Blister
Carboset GA7513	8.4	46.2	3250	n/a	Paper Cups
BlisterBond Pro	8.0	44.9	340	n/a	Carded Blister

The most important requirements apart from sealing bonds in each of the end uses for the heat-seal lacquers are determined by market requirements as well as compliance requirements and can be summarized as follows:

Food Contact Lidding films (Trays & Yogurt):

Main requirements for food contact lidding films are:

- Coating weight dry between 4-8 g/sqm.
- Good block resistance. Odour-free, tasteless, colourless. Sensory perfect.
- BADGE, epoxy and chlorine free. Aqueous based, if possible, without co-solvents.
- Approved according to FDA 175.300.
- Application by gravure coating process, machine speed 160-400 m/min.
- Sealing conditions in the lab: 0.5s/200°C/460N sealing against PS, PP, PET.
- Market conditions were to achieve a high bond (up to 10Nw) at the following sealing conditions: 200°C / 600N / 0.5 seconds.
- Maintain bonds after immersion with Lactic Acid solution (3%) or any other reagents contained in the food.

Pharmaceutical Blister

Some of the requirements that must be met are:

- Coating weight dry 3-5g/sqm.
- Odourless, tasteless and colourless. Good block resistance. Good hot tack properties.
- Badge and epoxy free. Water-based alternative to current solvent based technology. Chlorine-free not absolutely necessary but desirable
- Approved according to FDA 175.300.
- Excellent adhesion on aluminium foil (20 μ). Seal values should be >10N/15mm.
- Sealing conditions in the laboratory: 0.5s/150°C/250N sealing against PVC.
- Expected sealing values 8-10N/15mm.
- Application by gravure coating process, machine speeds 160-400 m/min.

Carded Blister

Some of the key features & benefits of this market segment are

- Excellent seal response / Improved fiber tear characteristics
- Expanded ability to seal to blister films / Effective with both PVC & PET substrates*
- Lower seal temperatures / Faster converter line speeds affording higher efficiencies
 - 10° – 15°C lower than typical water-based systems
 - Within 5° – 10°C of typical solvent-based systems
- Superior Clarity / Enhanced Gloss & Appearance
- One Component System / Improved product stability

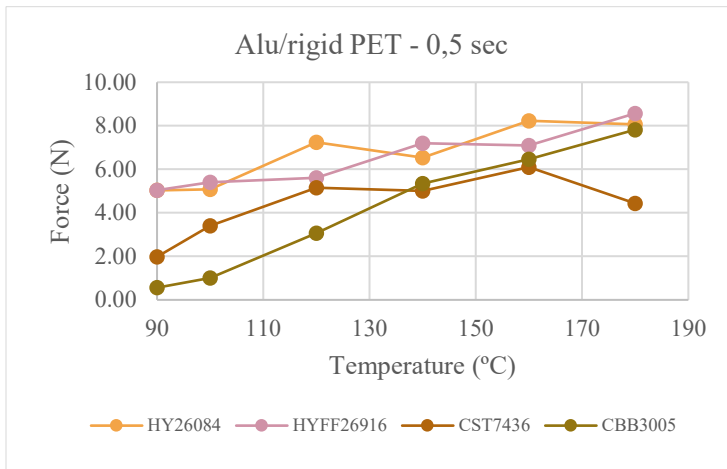
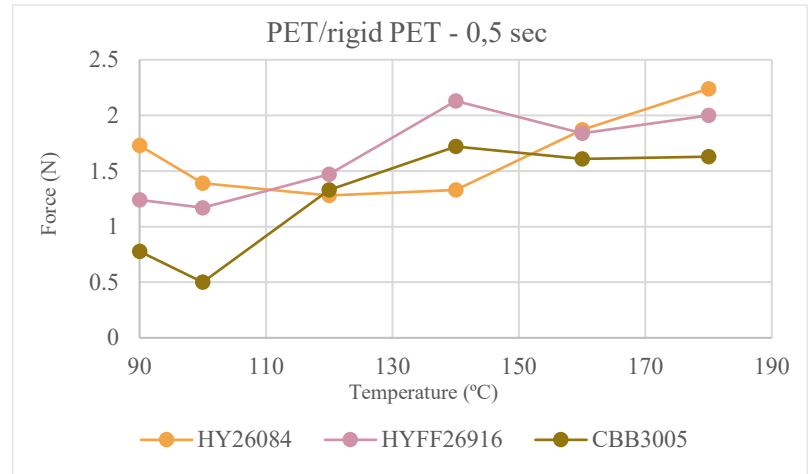
Performance

This Application guide covers heat-sealability testing of Lubrizol Advanced Materials Heat Seal Lacquers for Packaging on each one of the aforementioned structures under lab conditions.

Food Contact Lidding films

This section includes both PET lidding films for PET trays & Aluminium for yogurt lidding.

Testing was carried out by applying the heat - seal lacquer on the lidding film and sealing against rigid PET at different temperatures at 3 Bar with both jaws (upper and lower) heated at the desired temperature. Lidding substrates selected are 12 mic. clear Corona treated PET and 12 mic Aluminium foil. Blocking tests were also completed in order to assess the performance of the selected products.



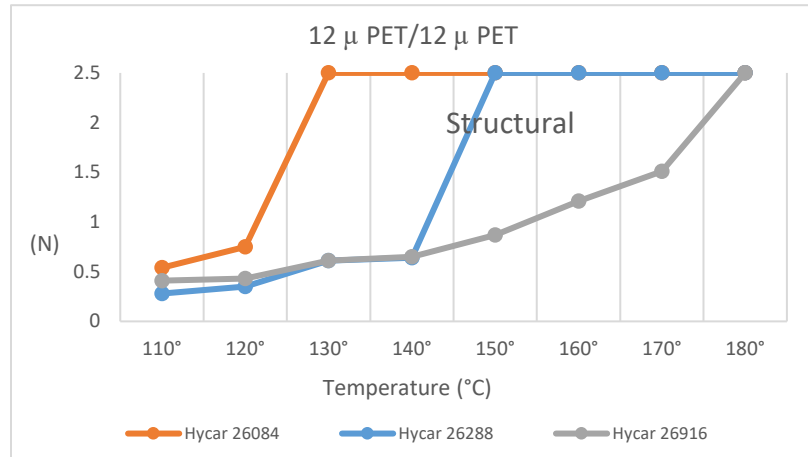
Yogurt Lidding

Yogurt lidding heat seal lacquers have been assessed using Rigid PET and also PS. Heat-seal bonds in this particular application have also been assessed after 24 hours immersion in a 3% Lactic Acid water solution in order to evaluate the stability of the structure in contact with the contents. Heat-seal bonds after immersion using Carbobond 3005 went down 5-7% depending on the Plastic used (PS, PET) and also on the Aluminium foil supply used.

Food Contact Flexible films

PET is a widely used film in packaging that does not heat-seal as polyolefins normally do. In order to make flexible packaging structures such as pouches, wraps etc. heat-sealable, only the introduction of a polyolefin or a heat-sealable lacquer would make the packaging structure sealable against itself or against PET.

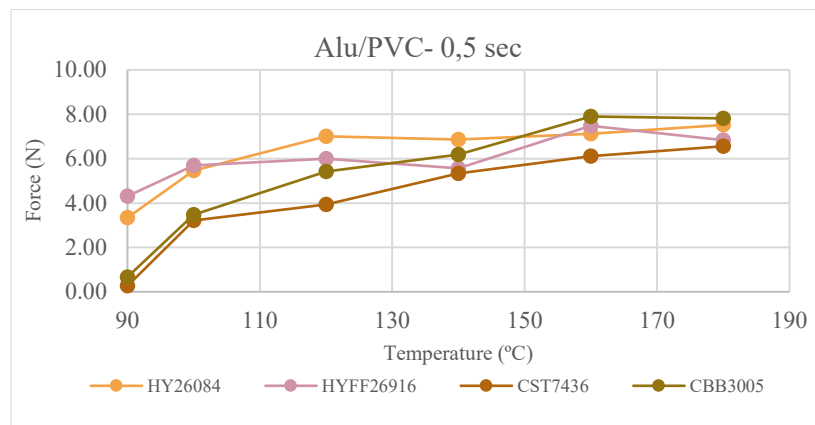
Heat-sealable lacquers used in packaging applications must have full food contact compliance as they will be most likely in contact with food. As the lacquer will be applied on the PET film in a previous stage, all lacquers must show excellent blocking resistance as reels will be stored for significant amount of time before being transformed into packaging.



Pharmaceutical Blister

Most common pharmaceutical blister applications are based on rigid PVC heat-sealed against a lacquered aluminium foil.

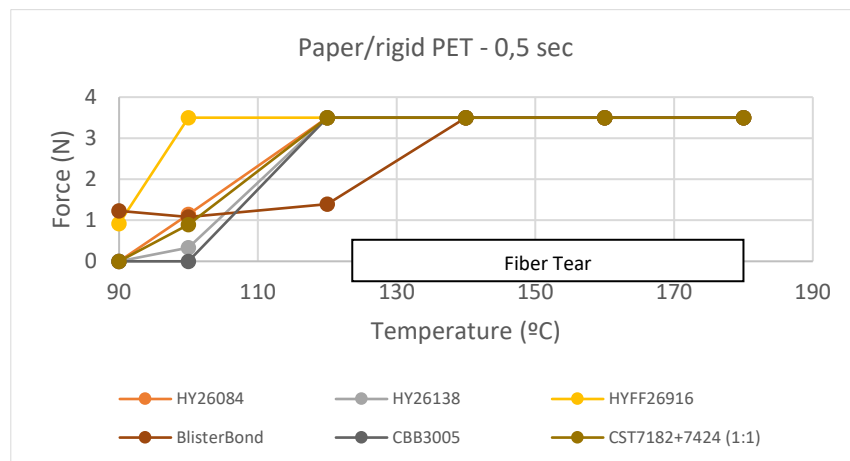
As the aluminium foil is lacquered before the packing process both blocking resistance and heat seal bonds are critical properties in this application.



Carded Blister

In considering blister packs of paper with rigid PET, the main focus was to study whether the paper broke causing fibers, which is called Fiber Tear and it is a standard test in the industry.

Carded blister lacquers are applied after printing the cardboard using several ink technologies, the most used being offset and UV inks. The blister lacquers are applied on-line after printing like an Overprint Varnish and so they must wet and adhere to the ink very well



Blocking testing has been evaluated both at room temperature and elevated temperatures both face to back and face to face in the various main substrates that have been use in the types of packaging described in this application guide.

(600Kg/cm ² / 40°C / 24hrs)	Pet 12µm	Alu foil 20µm	Paper (65gr)
Hycar 26084	OK	OK	OK
Carbobond 3005	OK	Slight	OK
Hycar 26916	OK	Slight	OK
Carboset GA 7436	OK	OK	OK
Hycar 26138	OK	Slight	OK
CST7182 1/1 GA-7424			Slight

(600Kg/cm ² / 23° / 24hrs)	Pet 12µm	Alu foil 20µm	Paper (65gr)
Hycar 26084	OK	OK	OK
Carbobond 3005	OK	OK	OK
Hycar 26916	OK	OK	OK
Carboset GA 7436	OK	OK	OK
Hycar 26138	OK	OK	OK
CST7182 1/1 GA-7424			OK