

PLASTIC ADDITIVES  
**MODIFIERS**



At a glance:

# Fields of application

## Fields of application

Product	PVC HT-modifier	PVC HI-modifier	PVC foils	Plasticizing polymer	POM HI-modifier	PVC grafting core
Baymod® AT 68	●					
Baymod® AT 49	●	●				
Baymod® A 60		●	●			
Baymod® A 52		●				
Baymod® A 80			●			
Baymod® A 82			●			
Baymod® PU				●		
Baymod® PU-A					●	
Baymod® L 450P						●
Baymod® L 2450		●				
Baymod® L 2453		●				
Baymod® L 2418				●		



The unique advantage:

## Expertise of a strong partner

With decades of experience and customers spread across the globe, LANXESS is already one of the world's major chemical manufacturers. LANXESS was formed in 2004 through the carve-out of major portions of the chemical activities of the Bayer Group and parts of its polymer operations, which means it has many years of experience to look back on, with roots going all the way back to the founding of Bayer in 1863. This is the basis on which LANXESS now develops, produces and markets a portfolio consisting of basic and fine chemicals, color pigments, plastics, fibers, special-purpose rubbers, rubber chemicals, material protection and water treatment products and chemicals for the production of leather, textiles and paper. In so doing, LANXESS provides reliable solutions worldwide for a wide range of different applications.

LANXESS has the experience and sound market knowledge of an established global player, combined with the commitment of a new, young enterprise. This is a combination that makes LANXESS strong and active. We are ready to break new ground, when and wherever our customers ask us to go.

You want the very best – so do we. Together we can build on this common ground, because LANXESS offers you the best conditions for a continued and successful partnership. Our claim is to provide our partners with all-important stimulus through innovative concepts and a customer-focused and solution-oriented approach that allows you to develop unique products.

In the area of plastic additives this involves, above all, a consistent strategy to meet the market's commercial, technical and chemical demands, alongside a wide range of products. LANXESS taps extensive expertise and application-related experience for the development of modifiers, plasticizers, bonding agents and blowing agents, and as a customer you benefit from this. From the development of formulations and

individual customization to meet specific product requirements through to process optimization, knowledge from each individual area of application is used consistently to enable optimization in all related areas. In addition, LANXESS has a network of research and testing departments that ensures worldwide proximity to customers and an ability to respond quickly.

And last but not least, in all our activities, we focus on one thing, namely maintaining the ecological equilibrium by taking special safety measures and remaining aware of our responsibilities in the future. After all, LANXESS's solutions involve much more than just supplying raw materials. They are always the end product of well thought out, forward-looking development, adapted to meet your requirements.

Rigid PVC is a traditional construction material. In order to extend its range of applications and to improve its processing and service qualities, special high polymers are added to the plastic. These additives, which have a considerable effect on the mechanical properties of PVC, are called modifiers.

Whether a high polymer compound is suitable as a modifier depends primarily on the extent to which the desired effect can be achieved with its aid. There is a good chance of successfully achieving a marketable product if the potential additive is compatible with PVC and processing of the plastic is not adversely affected by the additive. The levels at which these modifiers are used vary according to the type and purpose of use between 0.5 and 15 percent by weight.

Pure polyvinyl chloride has two problem areas:

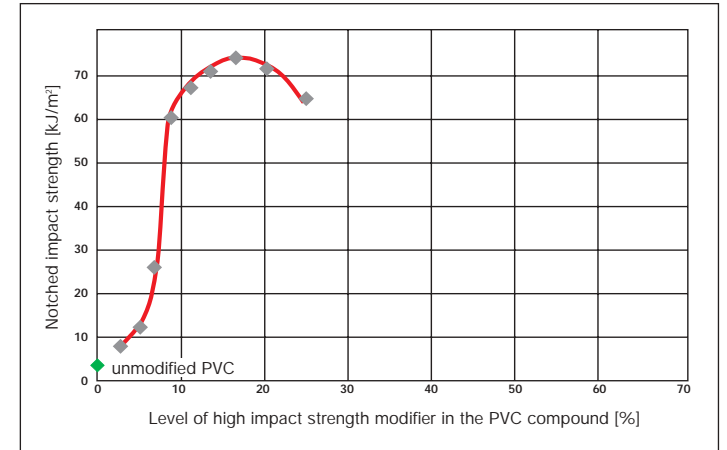
- insufficient toughness, especially at low temperatures
- low thermal resistance

Both weaknesses can be improved by using polymer modifiers.



Rigid PVC modified with Baymod® A 52

Modification of impact strength has developed in the course of time into a specialty area of PVC production and processing. The basic idea of the process now carried out on a large scale is the introduction of elastomers or thermoplastics containing elastomers into rigid PVC. The resulting multiphase systems are characterized by high impact or notched impact strength.



Impact strength modification of PVC with Baymod® A 52  
Notched impact strength according to DIN 53453 (r=0.1 mm)

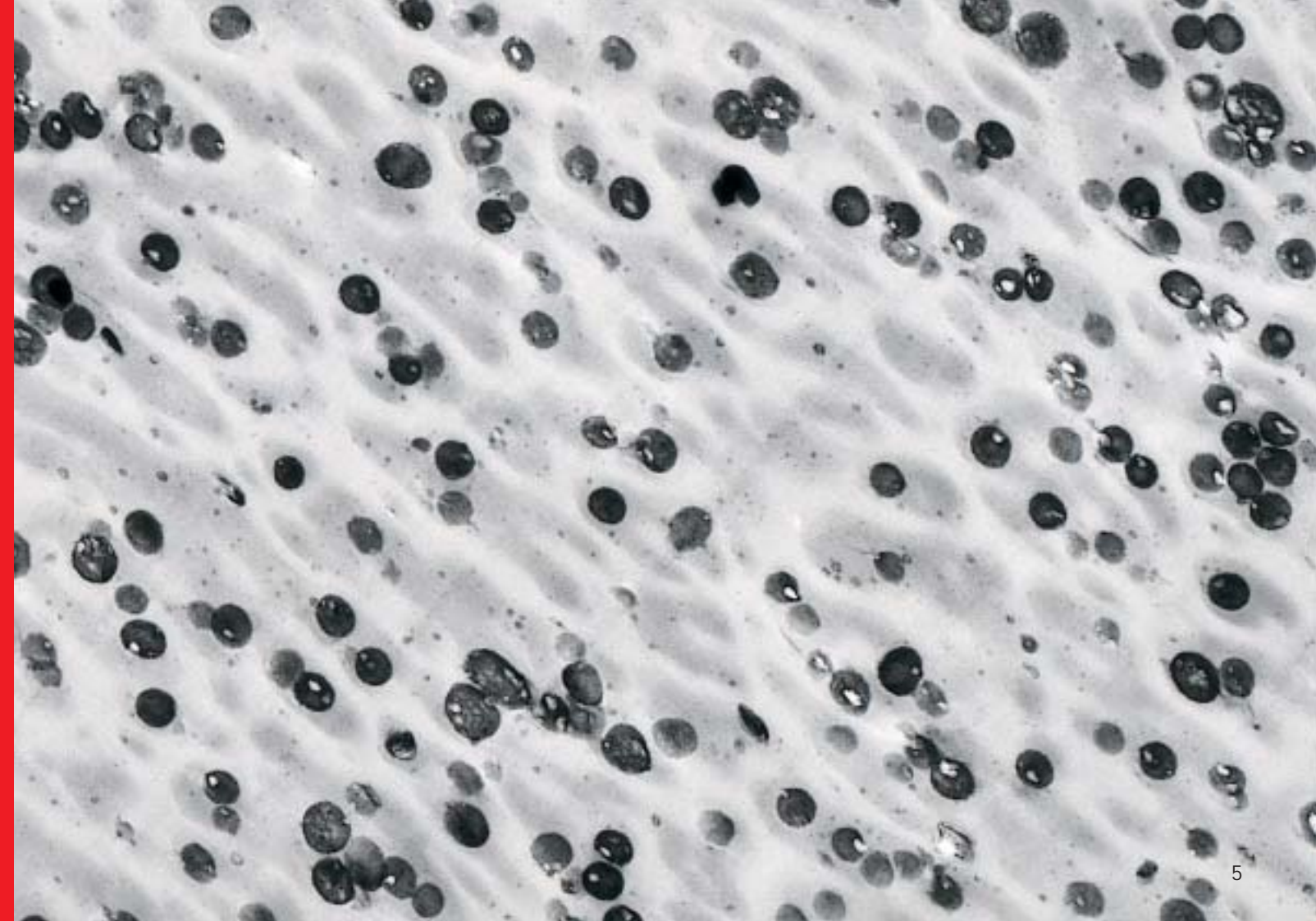
#### Impact strength modification of rigid PVC

Modifier	Supplied as	Mean bulk density [g/l]	Release agent	Notched impact strength [kJ/m²]*
Baymod® A 52	ABS powder	approx. 280		15*
Baymod® A 60	ABS powder	approx. 325		10*
Baymod® L 2450	EVA powder		PVC/silica/talc	28**
Baymod® L 2453	EVA powder		PVC/silica/talc	27**

\* Compound: 100 parts by weight PVC with 8 parts by weight Baymod® A; PVC (unmodified): notched impact strength 2-4 [kJ/m²] according to DIN/ISO 180 A (r=0.1 mm)  
\*\* Compound: 100 parts by weight PVC with 6.5 parts by weight Baymod® L; PVC (unmodified): notched impact strength 2-4 [kJ/m²] according to DIN/ISO 180 A (r=0.1 mm)

As tough as you want:

# High impact modifiers



Any plastics processor involved in producing sheet and molded sections will value one material characteristic in particular: resistance to heat distortion. With unmodified rigid PVC this is not good enough for many areas of use. However, the selective use of HT modifiers can lead to the production of high-quality, thermally resistant PVC, which is able to supplant other expensive thermoplastics.



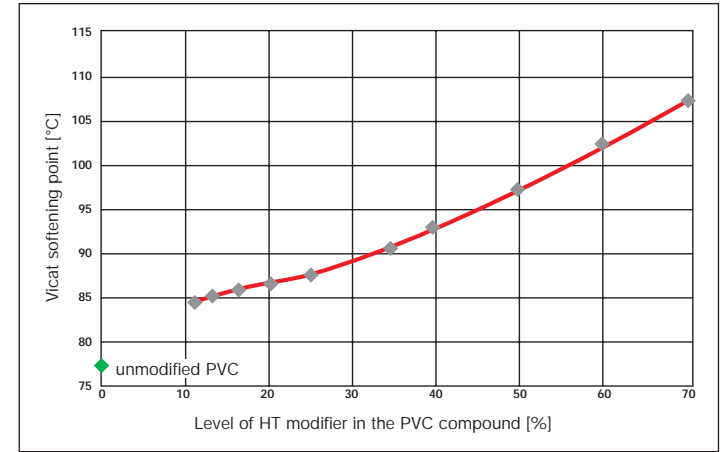
PVC without HT modifiers at increasing temperatures



PVC with HT modifiers at increasing temperatures

Low-elastomer ABS polymers and special styrene-acrylonitrile resins (SAN resins) are first in line as HT modifiers.

Adding these HT modifiers in amounts between 30 and 60% improves the Vicat heat distortion temperature of PVC by 10 to 15 °C. When added even in small quantities of 1 to 5 parts these modifiers improve PVC processability. They also have a beneficial influence on the melt behavior and the dispersion of pigments and stabilizers in the plastic matrix. The basic mechanical properties of rigid PVC are maintained (even in the upper concentration range). A beneficial side effect of the HT modifiers is that they produce an enhanced surface gloss on the PVC and vastly improve the thermoforming properties of the sheet.



High-temperature modification of PVC

### High-temperature modification of rigid PVC

Modifier	Supplied as	Bulk density [g/l]	Vicat B <sub>120</sub> DIN/ISO 306 [°C]*
Baymod® AT 68	low-dust powder	approx. 520	116-124
Baymod® AT 49	low-dust powder	approx. 520	min. 112

\* Compound: 60 % by wt. PVC and 40 % by wt. Baymod® A: PVC (unmodified): Vicat temperature approx. 80 °C

Baymod® AT 68 and Baymod® AT 49

In good shape:

# High-temperature modifiers





Staying flexible:

# Plasticizing polymers

The flexibility of PVC materials is just as much a basic requirement as plastics with high impact strength or heat distortion resistance. There are three groups of products for plasticizing PVC and other thermoplastics:

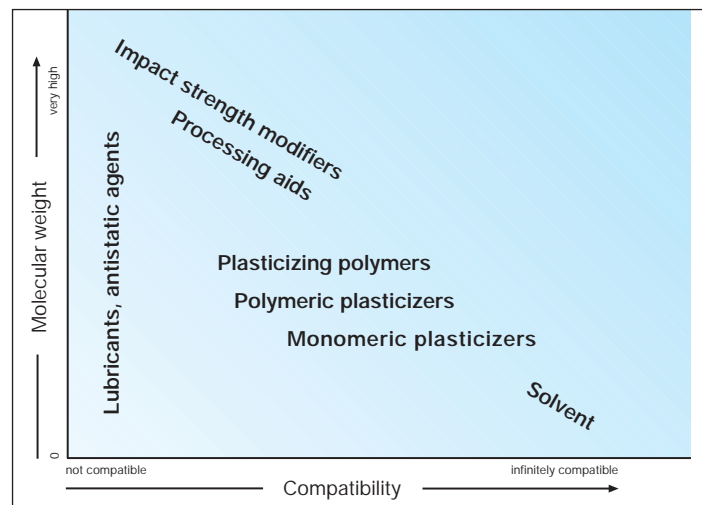
- monomeric plasticizers
- polymeric plasticizers
- plasticizing polymers

The differences between the three groups of products are principally in molecular weight. The smaller and lighter the molecules, the more these modifiers are generally compatible with PVC.

Plasticizing polymers have the highest molecular weight. Examples of important material properties, improved by this type of modifier, are as follows:

- migration resistance
- low compression set
- high abrasion resistance
- fuel and oil resistance

In order to optimize these properties of PVC, LANXESS has several products in the plasticizing polymers group to cater for the wide-ranging demands of the plastics processor.



## Plasticizing of PVC

Modifier	Supplied as	Density [g/cm <sup>3</sup> ] (15s)*	Shore A/D
Baymod® PU	powder	1.15	94/53

\* Compound: 60% by wt. S-PVC and 40% by wt. Baymod® PU and 3 parts by weight epoxidized soya bean oil; PVC (unmodified): Shore D 82

Modifier	Supplied as	VAC content [%] (15s)*	Shore A/D
Baymod® L 2418	granules	68	91/49

\* Compound: 60% by wt. PVC and 40% by wt. Baymod® L; PVC (unmodified): Shore D 82

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#### Forward-looking statements

This brochure contains forward-looking statements based on current assumptions and forecasts made by LANXESS Deutschland GmbH management. Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future consolidated

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