

Wallpaper, PVC & plasticisers

Key facts about an important subject

Because of their wide range of designs, wallpapers play a key role in interior decoration today. Trends in wallpaper design clearly reflect consumers' demands for a modern wallcovering with new textures, colours, new tactile properties and 3-D effects. Thanks to the use of PVC, it is now possible to manufacture wallpapers which have these special properties.

This brochure contains interesting facts about the use of PVC and plasticisers in wallpaper manufacture. More general information on the subject of the environment and wallpapers can be found in the brochure "Wallpaper and the environment".

I. Interesting facts about PVC

PVC (polyvinyl chloride) has been manufactured for more than 50 years and is one of the oldest synthetic polymers. It is produced in two forms: hard and soft PVC. PVC is manufactured from crude oil and industrial grade salt. Ethylene is formed from crude oil by the thermal cracking of naphtha as an intermediate stage of production. Chlorine is extracted electrochemically (by chloralkali electrolysis) from industrial grade salt, mainly by means of the membrane process, which does not use mercury and consumes little electricity. Sodium hydroxide and hydrogen are produced as important by-products in this process and are used in turn as raw materials in the synthesis of many other products.

For over 20 years, the PVC sector has been developing ways of minimising the environmental impact caused by the manufacture, use and disposal of its products. As part of the voluntary commitment "Vinyl 2010" specific guidelines for improving sustainable product management during the entire life cycle of PVC products were agreed and have been rigorously implemented.

The German PVC processing industry consists mainly of medium-sized companies, some of whose products are world market leaders. The material has become one of the most important plastics used in industry with a very wide range of applications. Most PVC products are inexpensive and cost little to maintain.

II. PVC and wallpaper

Many modern wallpapers are manufactured without the use of PVC. The surface of other wallpapers marketed in the Federal Republic of Germany is coated with plastic, mainly with polyvinyl chloride.

PVC is a chloroorganic substance which is one of the most widely used materials of all owing to its excellent wearing qualities. In order to achieve the required properties of the material, such as strength and flexibility, PVC must be mixed with stabilising agents and plasticisers. The stabilising agents used in the wallpaper industry are based mainly on calcium, zinc or barium salts of organic acids. Toxic elements such as cadmium and lead are never used in the manufacture of wallpapers. Organic tin compounds have not been used for several years.

III. Typical products made from hard and soft PVC

- Window and door profiles
- Hard films (pharmaceutical sector)
- PVC cables
- Medical applications (blood bags, adhesive plasters or cold packs)
- Floor coverings, roofing membranes, interior trim of motor vehicles
- Labelling foil and furniture films
- Synthetic leather products (bags, shoes and armchair covers)
- Embossed and flat vinyl wallpapers (PVC as full-surface coating or partial texturing)

IV. Plasticisers in PVC

About 30 percent of the PVC produced is treated with plasticisers to produce soft PVC products. Plasticisers give PVC products special wearing qualities similar to those of rubber. The material, which is naturally hard, is made flexible and ductile, while retaining its dimensional stability, by the addition of this additive. Soft PVC mixtures can be processed by nearly all methods.

Soft PVC is used to manufacture flexible products such as synthetic leather, wallpapers, easy to clean, hardwearing floor coverings or fire-retardant cables. In the medical sphere, PVC products are particularly recommended for allergy sufferers. Soft PVC products in the form of blood bags or wound dressings can save lives. Plasticisers can be dispersed evenly between the chains of crosslinked polymers, making them more flexible.

However, plasticisers do not form a chemical compound with the plastic but are merely bound to it physically. They can therefore also evaporate from the plastic again or can be dissolved out of it (if they come into contact with liquids or fats).

The manufacture, processing and storage of plastics are subject to strict statutory rules and regulations. In the production of PVC wallpapers, plasticisers serve to increase the material's flexibility and ductility, thereby making the products easier to process. Plasticisers often contain phthalates which are among the substances known as semi-volatile organic compounds.

IV.I DINP (diisononyl phthalate)

This plasticiser is used in the manufacture of wallpapers awarded the RAL quality mark. DINP is also used in the manufacture of cables, films, coated fabrics, floor coverings, gym mats, shower curtains and the soles of shoes. Following extensive toxicological tests, DINP has been classified as non-hazardous to health and can be used safely.

The use of DINP in embossed and flat vinyl wallpapers poses no health risks to consumers. The environmental behaviour of DINP is non-hazardous according to an EU risk assessment. High-molecular weight phthalates have now largely superseded low-molecular weight phthalates such as DEHP (2-ethylhexyl phthalate) or DBP (dibutyl phthalate) in Western European markets. Other plasticisers such as polymer plasticisers, adipates and other phthalate-free plasticisers are also commercially important, especially in special applications.

IV.II Hexamol® DINCH (diisononyl cyclohexane-1,2-dicarboxylate)

This plasticiser was initially recommended for use in sensitive products such as toys, childcare articles and medical equipment. Since then Hexamol® DINCH has been used in

numerous applications such as food packaging, sporting goods, cable sheathing or paints. It is also used as a phthalate-free raw ingredient in the manufacture of wallpapers. The plasticiser has proved its worth in practice and meets the strict provisions of EU Directive 2005/84/EC.

The typical features of blown vinyl and vinyl wallpapers are preserved, e.g. their three-dimensional quality and tactile properties, enabling the products to be processed to high quality standards.

Hexamol® and DINCH are registered trademarks of BASF SE.

V. Wallpapers and plasticisers

Only semi-volatile plasticisers are used in the manufacture of wallpapers, because these substances remain in the product whereas volatile substances accumulate in the air.

In accordance with Chapter 3.2.3 of the latest quality assurance and test specifications dated January 2011, wallpapers awarded the RAL quality mark RAL-GZ-479 may therefore only contain semi-volatile plasticisers, mainly diisononyl phthalate (DINP), when used in living areas. Short chain chlorinated paraffins may not be used under any circumstances.

Plasticisers used by holders of the RAL quality seal cannot be detected analytically under normal living conditions in the ambient air or in test chamber tests. Human exposure to plasticisers in interior rooms decorated with wallpaper is thus clearly below possible danger levels.

This information brochure demonstrates the efforts made by German wallpaper manufacturers to provide consumers and customers with sustainable products that are absolutely safe in ecological and health terms. At the same time, German manufacturers are able to comply with the strict EU directives and in some cases manufacture products that are clearly below the specified limit values.