

Important for Manufacturers and the Trade

Plasticizers in Consumer Goods

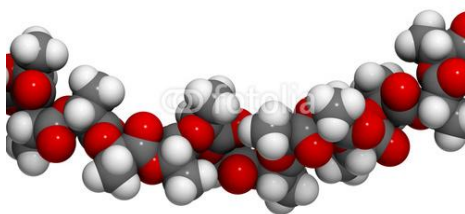
Mention of the term “plasticizer” can trigger ambivalent feelings: On the one hand, plasticizers are associated with the technological advances of the plastics age. Plastic articles are nowadays almost indispensable; in many cases there are simply no alternatives. On the other hand, there is a deep-seated fear of a possible health hazard posed by the ever-increasing flood of products containing plasticizers. For manufacturers the legal situation often appears somewhat opaque. Some plasticizers are banned, others permitted only for use in certain groups of articles. Moreover, additional national regulations exist in various European countries.

Plasticizers are used in the production of soft, elastic, and flexible plastics. These substances have numerous applications. They are found not only in typical plastic articles such as plastic bottles, storage vessels, rubber boots, electric cables, or plastic toys, but also in textiles, paints, varnishes, adhesives, wallpapers, flooring materials, and cosmetics. Some plasticizers have meanwhile been banned because they constitute a health hazard. Any mention of plasticizers usually refers to the most commonly used phthalate-containing plasticizers. However, the group of plasticizers is much broader and includes not only manufactured phthalate-containing and non-phthalate plasticizers produced by chemical manufacturing processes but also a number of plasticizers based on natural products.



Plastic bags are typical plasticizer-containing everyday articles

Function of Plasticizers



Poly lactides (PLA) consist of chains of lactic acid molecules and are classified as biopolymers

Plastics are generally produced by polymerisation. Small basic fragments (known as monomers) link together to form long chains and thus become polymers. These chains lie close together upon one another or are tangled. Depending upon the plastic, these structures are either hard and brittle or flexible and elastic. In order to make plastics soft, flexible, or elastic it is necessary to add plasticizers during the production process. The plasticizers enter the spaces between the fragment chains.

They do not bind firmly to the chain fragments but remain freely mobile. Just like little rollers, the included plasticizers enable the polymer chains to glide past one another, thus making the plastic flexible. The concentration of plasticizer used can vary widely. Plastics such as PVC or PC (polycarbonate) may consist of up to 40 or even 45 percent of plasticizers. Some plasticizers are truly multi-talented and can fulfil other functions in a product. For example, they can act as flame retardants in electronics equipment or as stabilisers and solubilisers in paints, adhesives, or cosmetics. In turn, this means that our focus should not be restricted to plasticized plastics but should also include a number of other products which would hardly be expected to contain plasticizers.



Without plasticizers running would hardly have become a popular sport

Effects on Health

Owing to their free mobility in plastics, plasticizers can be released into the environment. This can be seen in the case of older plastics which have become brittle and fragile after several years. The plasticizers migrate out of the plastic and either evaporate into the atmosphere or – in the case of storage vessels – move into the contents. In this way they enter the environment, the human body, the air we breathe, and the food we eat.

Some plasticizers could be shown to constitute a hazard to health. They have a disruptive effect on our hormone system, are responsible for reproductive disorders, and prove to be hepatotoxic and nephrotoxic. Moreover, many plasticizers are highly persistent, and can thus accumulate in water, plants, and animals.

Statutory Regulations

The steadily increasing industrial use of plasticizers and the resulting ever wider distribution of plasticizer-containing consumer goods have made statutory regulations necessary for those representatives of this class of substances which constitute a potential health or ecotoxicological hazard. Use of some plasticizers is prohibited by law. In addition, a large number of plasticizers have been included in the SVHC candidate list according to REACH, Annex 14, as “substances of very high concern”. Use of SVHC candidates is not prohibited, but there is an EU-wide legal duty to inform recipients as soon as the concentration limit for an SVHC candidate is exceeded.

In a recent judgement concerning the REACH Regulation, the European Court of Justice ruled on September 10, 2015 that in the case of a complex product the duty to inform already applies if one component of a product, i.e. one of the materials used (such as the sole material of a hiking boot), con-

tains an SVHC candidate at a concentration exceeding 0.1 percent by weight. This modified interpretation of the REACH Regulation also applies to plasticizers (see the article on the ECJ ruling in this issue of the Newsletter).

In Europe a number of additional country-specific regulations have to be observed for some phthalates. Turkey has prohibited the six phthalates DEHP, DBP, BBP, DINP, DIDP, and DNOP in imported footwear. Denmark recently introduced a ban for the four phthalates DEHP, DBP, DIBP, and BBP in articles intended for indoor use. This ban was rescinded in 2014 under pressure from the EU. Denmark is now striving to have these four phthalates banned at a European level and will submit a relevant dossier in January 2016.

Alternatives

The plastics industry offers sufficient, but often expensive, alternatives, both in the area of plasticizers and in that of the plastics themselves. Plastics without any need for critical plasticizers include PP (polypropylene), PE (polyethylene), or PET (polyethylene terephthalate). Nowadays these materials are already used for producing many articles, e.g. in the food sector, for films, for textile fibres, for cables, and for piping. According to the Federal German Environment Agency, use of the phthalate plasticizer DEHP, which is regarded as highly critical, is on the decline. Instead, greater use is being made of longer-chain phthalates which are not subject to labelling according to EU criteria and are currently viewed more favourably with regard to their impact on human health.

Other toxicologically non-critical plasticizers include ATBC (acetyl tributyl citrate), DEHA (adipic acid bis(2-ethylhexyl) ester), DINCH (1,2-cyclohexanedicarboxylic acid diisononyl ester), DOTP (terephthalic acid bis(2-ethylhexyl) ester) or ASE (alkylsulphonic esters). Plasticizers based on natural products such as resins, oils, citrates, or succinates can also be used for many plastics. Use of natural products does not automatically mean that the product is non-harmful. Many natural products are toxic or allergenic. As in the case of chemically produced plasticizers, plasticizers based on natural products should not have a detrimental effect on the environment or on human health.

If you have any questions, do not hesitate to contact:

Dr. Ines Anderie

Chemical Analysis

Tel.: +49 6331 2490 712

E-Mail: ines.anderie@pfi-germany.de

Most important EU regulations for plasticizers a)

	Use prohibited by law	SVHC candidate / REACH, Annex 14
Phthalate-containing plasticizers		
DEHP Di(2-ethylhexyl) phthalate	Toys, cosmetics baby articles, paints Turkey: For all imported foot- wear	Yes
DBP Dibutyl phthalate		Yes
BBP Benzyl butyl phthalate		Yes
BMEP Bis-(2-methoxyethyl) phthalate		Yes
DPP Dipentyl phthalate branched and linear		Yes
DHP Di-n-hexyl phthalate		Yes
DHNUP 1,2-Benzenedicarboxylic acid, di-C7–11 branched and linear alkyl esters		Yes
DINP Di-iso-nonyl phthalate	Toys Turkey: For all imported foot- wear	No
DIDP Di-iso-decyl phthalate		No
DNOP Di-n-octyl phthalate		No
DIBP Di-iso-butyl phthalate		Yes
DIPP Di-iso-pentyl phthalate		Yes
PIPP n-Pentyl iso-pentyl phthalate		Yes
DIHP 1,2-Benzenedicarboxylic acid, di-C6–8 branched alkyl esters, C7-rich		Yes
1,2-Benzenedicarboxylic acid, dipentyl esters, branched and linear		Yes
1,2-Benzenedicarboxylic acid, dihexyl esters, branched and linear		Yes
1,2-Benzenedicarboxylic acid, di-C6–10 alkyl esters; 1,2-benzenedicarboxylic acid, mixture of C6, C8, and C10 alkyl esters with ≥ 0.3 % DHP		Yes
Non-phthalate plasticizers		
Nonylphenol	Textiles, leather	Yes
Octylphenol		Yes
Chloroparaffins, short chain C10–C13	All materials	
Tris-(2-chloroethyl) phosphate		Yes
Trixylyl phosphate		Yes
Triphenyl phosphate	Toys	
Tricresyl phosphates (o,m,p isomers)	Toys	
Anthracene or anthracene oils		Yes
Formamide		Yes

a) Regulations for consumer articles coming into contact with foodstuffs are not included in the table.