



Phthalates

Other Names: Phthalate esters Plasticisers

CAS Number	Substance
28553-12-0	Di-iso-nonylphthalate (DINP)
117-84-0	Di-n-octylphthalate (DNOP)
117-81-7	Di(2-ethylhexyl)-phthalate (DEHP)

Phthalates are a family of chemical compounds primarily used to make plastics, PVC, or vinyl flexible and pliant. Phthalates are the most commonly used plasticisers in the world and are categorised as high and low phthalates depending on the molecular weight. Since phthalates are not chemically bound to the polymer molecule, they can be released from products or dissolve when in contact with liquids or fats. As a result, phthalates may migrate out of a material, resulting in exposure to humans and the environment. **1**

List continued in “Additional Information”

May Be Found In:

- Plastics
- Polyvinyl chloride (PVC)
- Cellulose acetate
- Coatings (e.g. polyurethane)
- Screen print and heat transfer inks
- Plastisols
- Adhesives
- Solvents
- Cosmetics and personal care products
- Insecticides

Uses in the Supply Chain

Phthalates are a family of chemicals that may be blended as an additive into special plastics in order to increase the performance of the material. Phthalates are used to soften plastics, making them more flexible or more durable. Phthalates are sometimes used to decrease the melting temperature of plastics to aid the moulding process.

Phthalates are used in hundreds of products including vinyl flooring, adhesives, detergents, lubricating oils, automotive plastics, plastic clothes (raincoats), and personal-care products (soaps, shampoos, hairsprays, and nail polishes). Phthalates are used widely in polyvinyl chloride plastics, which are used to make products such as plastic packaging film and sheets, garden hoses, inflatable toys, blood storage containers, medical tubing, and some children's toys.¹ There has also been a wide application in screen print, heat transfer inks, and plastisol inks.³

Why Phthalates are Restricted

- Legislation in major markets around the world restricts the presence of phthalates in final products. These regulations vary for individual phthalates restricted, depending on country and locality.
- Phthalates have been linked to adverse health impacts including hormone disruption and reproductive and developmental issues.
- Phthalates can be released to the environment through use or directly from manufacturing processing facilities, via wastewater. They impact through bioaccumulation in the aquatic system, creating a potential for bioaccumulation in smaller aquatic animals like fish or oysters.²
- Chemical hazard information for many chemicals can be found in the following external databases:
 - GESTIS Substance Database: [http://gestis-en.itrust.de/nxt/gateway.dll/gestis_en/000000.xml?f=templates\\$fn=default.htm\\$vid=gestiseng:sdbeng\\$3.0](http://gestis-en.itrust.de/nxt/gateway.dll/gestis_en/000000.xml?f=templates$fn=default.htm$vid=gestiseng:sdbeng$3.0)
 - US National Library of Medicine: <https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>
 - USA EPA Occupational Chemical Database: <https://www.osha.gov/chemicaldata/index.html>

Sourcing Compliant Materials from Your Suppliers

- Explain that you require materials to be compliant with current AFIRM RSL limits.⁴
- Request suppliers to submit a confirmation of material compliance and/or a test report from a third-party laboratory. When materials are received, consider performing random, risk-based testing to ensure current AFIRM RSL limits are met.
- Share this guidance sheet with your material suppliers. Using the guidance in the next section, instruct them to work with their chemical suppliers to source chemical formulations that comply with these requirements. If needed, highlight the existence of harmful substances in materials via chemical management trainings from the ZDHC Academy, existing guidelines, and laws.
- Pay special attention to:
 - Materials with polymeric coatings or finishes. Phthalates are common ingredients in coatings, screen printing inks, and finishing treatments.
 - Phase out the use of PVC as the main source for phthalates. Replace with other less harmful plastics.
 - Applications such as plastisol, plastic trims, buttons or shoelace tips (aglets), and other accessories should be reviewed for phthalates.
- Make sure all your suppliers have a solid chemical management system in place.

Sourcing Compliant Formulations from Your Chemical Formulators

- Explain to chemicals suppliers that you require chemical formulations to comply with current ZDHC MRSL limits.
 - Search for formulations on the ZDHC Gateway Chemical Module. If your preferred formulations are not listed, encourage providers to register their formulations.
 - Ask for a ZDHC ChemCheck report.
- For all formulations, request SDS documentation to ensure none of the CAS Numbers above are listed as ingredients.
- Any chosen alternative chemical formulation must be ZDHC MRSL compliant whenever applicable.

Safer Alternatives

The chemicals listed below have been identified as potential alternatives by the U.S. Environmental Protection Agency and/or by the Danish Environmental Protection Agency. These alternatives include citrates, sebacates, adipates, and phosphates. They are being substituted in products that traditionally use phthalates such as toys, childcare items and medical devices. In addition to their application as alternative PVC plasticisers, these substances are also used as solvents and fixatives in cosmetic products, inks, adhesives, and other consumer products. Although many of these alternatives show promising results, it should be noted that until now, alternative formulations have not been studied well enough to make a final conclusion.

Another substitution approach will be the selection of plastics that do not need phthalates as a softener. Petroleum based plastics therefore could be PU, EVA, PET, HDPE, PP and others.

Bio-based plastics might also be an alternative as they do not require phthalates for softening purposes. But it should be noted that not all bio plastics have been evaluated for environmental and associated human health effects.

Any substitution using the chemistries below must be vetted to ensure a regrettable substitution is not made.

CAS Number	Substance
77-90-7	Acetyl tributyl citrate (ATBC)
642286-2	Bis(2-ethylhexyl) terephthalate (DEHT/DOTP)
103-23-1	Di(ethylhexyl) adipate (DEHA)
166412-788-8	Diisononyl cyclohexane-1,2-dicarboxylate (DINCH)
122-62-3	Dioctyl sebacate (DIDS)
3319-31-1	Trioctyl trimetallitate (TOTM)
6846-50-0	Trimethyl pentanyl diisobutyrate (TXIB)

Additional Information

United States Product Consumer Safety Commission – Phthalates –

<https://www.cpsc.gov/Business--Manufacturing/Business-Education/Business-Guidance/Phthalates-Information>

United States Environmental Protection Agency – Assessing and Managing Chemicals under TSCA – Phthalates –

<https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/phthalates>

Full list of CAS Numbers and substance names for phthalates:

CAS Number	Substance
28553-12-0	Di-iso-nonylphthalate (DINP)
117-84-0	Di-n-octylphthalate (DNOP)
117-81-7	Di(2-ethylhexyl)-phthalate (DEHP)
26761-40-0	Diisodecylphthalate (DIDP)
85-68-7	Butylbenzylphthalate (BBP)
84-74-2	Dibutylphthalate (DBP)
84-69-5	Diisobutylphthalate (DIBP)
84-75-3	Di-n-hexylphthalate (DnHP)
84-66-2	Diethylphthalate (DEP)
131-11-3	Dimethylphthalate (DMP)
131-18-0	di-n-pentyl phthalate (DPENP)
84-61-7	dicyclohexyl phthalate (DCHP)
117-82-8	Bis(2-methoxyethyl)
84-76-4	Dinonyl phthalate (DNP)
131-16-8	Di-n-propyl phthalate (DPRP)
84-61-7	Di-cyclohexyl phthalate (DCHP)
27554-26-3	Di-iso-octyl phthalate (DIOP)

References

1 Centers for Disease Control and Prevention. National Biomonitoring Program – Phthalate Fact Sheet. Retrieved from https://www.cdc.gov/biomonitoring/Phthalates_FactSheet.html, 12/2017.

2 Hohenstein Institute & Textile Exchange. (2017). Chemical Snapshots – Phthalates. Revision 0.2. Retrieved March 17, 2017.

3 Centers for Disease Control and Prevention (2016). Fact Sheet - Phthalates. Retrieved August, 10, 2017, from https://www.cdc.gov/biomonitoring/phthalates_factsheet.html.

4 Apparel and Footwear International RSL Management Group (Ed.). (2018, January 31). Restricted Substances List (Rep.). Retrieved <http://afirm-group.com/afirm-rsl/>.

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