

Ergoplast® DOA (DEHA)

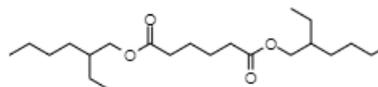
CHEMICAL NAME: bis(2-ethylhexyl) adipate; abbr. **BEHA**
OTHER NAMES: bis(2-ethylhexyl) hexanedioate; IUPAC name
 di(2-ethylhexyl) adipate; abbr. **DEHA**
 dioctyl adipate; abbr. **DOA**

CAS REGISTRY NUMBER: **103-23-1**

EC NUMBER: **203-090-1**

MOLECULAR FORMULA: **C₂₂H₄₂O₄**

STRUCTURAL FORMULA:



I. PROPERTIES

Ergoplast® DOA is a colorless, clear, and oily liquid with an undetectable odor. It is a practically water-insoluble ester (ca. 0.8 mg/dm³ at 22°C)¹, obtained in the esterification of adipic acid with 2-ethylhexyl alcohol. Ergoplast® DOA is compatible with other monomeric plasticizers used in polyvinyl chloride (PVC) processing and is miscible with common organic solvents, e.g. acetone, hexane or diethyl ether.

As a plasticizer, Ergoplast® DOA is characterized by a relatively low intrinsic viscosity (obtained plastisols have lower viscosity as well as good stability). It provides the plasticized material with flexibility and resistance to environmental stress cracking, particularly at low temperatures (up to approx. -50°C for PCV)². Moreover, thanks to its low volatility and insusceptibility to water extraction, bis(2-ethylhexyl) adipate makes the plastic material quite resistant to weathering¹.

Bis(2-ethylhexyl) adipate, the main component of Ergoplast® DOA, is readily biodegradable in water: >90% in 28 days (ECHA; met. OECD 301 F)³.

II. PHYSICOCHEMICAL PARAMETERS

Parameter	Unit	Required value	Test method
Color in Pt – Co scale (APHA color)	Hazen units	max. 20	PN-EN ISO 6271-1:2006 PN-C-04534-01:1981 ISO 2211
Density at 20 °C	g/cm ³	0.924 – 0.926	PN-EN ISO 12185:2002 PN-C-04504:1992 DIN 51 757
Refractive index n_D^{20}	-	1.446 – 1.448	PN-C-89401:1988 DIN 51 423
Acid value	mg KOH/g	max. 0.07	PN-C-89401:1988 DIN 53402/90
Flash point	°C	min. 210	PN-EN ISO 2592:2008
Water content	%	max. 0.1	PN-C-04959:1981 PN-ISO 760:2001 DIN 51777
Bis(2-ethylhexyl) adipate content	% by peak area	min. 99.5	GC – FID
Dynamic viscosity at 20 °C	mPa·s	13 - 15	ASTM 445 DIN 51 562

III. APPLICATIONS

Ergoplast® DOA is suitable for plasticizing a variety of polymers, including PVC as well as vinyl chloride copolymers, polystyrene, synthetic rubbers (butyl rubber)⁴ and cellulose derivatives – nitrocellulose or ethyl cellulose⁵. Plasticizer can be used either alone or blended with Ergoplast® DOT [bis(2-ethylhexyl) terephthalate], Ergoplast® DOS [bis(2-ethylhexyl) sebacate] or Ergoplast® ES (epoxidized soybean oil).

Exemplary products based on polymers plasticized with bis(2-ethylhexyl) adipate:

- transparent foils, flexible films (cling films) and food containers, especially frozen food packaging⁶;
- medical devices such as disposable infusion pumps⁷, regular monolayer PVC tubes⁸ or special flexible coextruded tubing with two or three layers⁶;
- outdoor water pipes;
- coatings (for cold-resistant electrical wires), surface coverings products and PVC plastisols;
- auxiliary agent in the production of paints and pigment pastes.

IV. FOOD CONTACT

Ergoplast® DOA meets the relevant legal requirements established in the following Regulations:

- Commission Regulation (EC) 10/2011 of 14th January 2011 on plastic materials and articles intended to come into contact with food, as amended, including Commission Regulation (EU) 2020/1245 of 2nd September 2020, amending and correcting Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, as amended, in Commission Regulation (EU) 2023/1442 of 11th July 2023 amending Annex I to Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, as amended to substance authorisations and addition of new substances;
- Bis(2-ethylhexyl) adipate is included in the EU list of permitted monomers, other starting substances, macromolecules obtained from microbial fermentation, additives and auxiliaries in the production of polymers, constituting Annex I to Commission Regulation (EC) 10/2011 of 14th January 2011 on plastic materials and articles intended to come into contact with food and may be used in the production of materials and products intended for contact with food;

FCM substance No.	Ref. No	CAS No	Substance name	Specific migration limit SML [mg/kg]
207	31920	103-23-1	adipic acid, bis(2-ethylhexyl) ester	18

- Commission Regulation (EC) 1935/2004 of the European Parliament and of the Council of 27th October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC.

V. PACKAGING AND TRANSPORT

Ergoplast® DOA transport is carried out in tankers, tank trucks, IBC tanks and customer's unit containers. Covered means of transport should be used to transport unit containers. Plasticizer should not be transported together with oxidizing agents or strong alkalis.

It is recommended to limit exposure to sunlight and moisture with a storage temperature of up to 30 °C. The warranty period is 12 months from the production date (for recommended storage conditions).

VI. SALES CONTACT

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VII. LITERATURE REFERENCES

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2. Walters, P., Cadogan, D. F., Howick, C. J. (2020) *Plasticizers in Ullmann's Encyclopedia of Industrial Chemistry*.
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4. Kuhakongkiat, N., et al. (2015) *Polymer*, 78, 208-211.
5. Wypych, A. (2017) *Databook of plasticizers 2nd Edition*. ChemTec Publishing.
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8. Wang, Q., Storm, B. K. (2005) *Polymer Testing*, 24(3), 290-300.