Danish Ministry of the Environment
Environmental Protection Agency

Justification Document for the Selection of a CoRAP Substance

– UPDATE –

Substance Name (public name): Reaction products of phosphoryl trichloride and 2-methyloxirane

List Number:
(EC Number): 807-935-0 (previously 911-815-4)

CAS Number: 1244733-77-4

Authority: Danish Environmental Protection Agency

Date: 17/03/2015

20/03/2018 (1. update)

18/03/2020 (2. update)

22/03/2022 (3. update)

Cover Note

This document has been prepared by the evaluating Member State given in the CoRAP update.

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1 IDENTITY OF THE SUBSTANCE

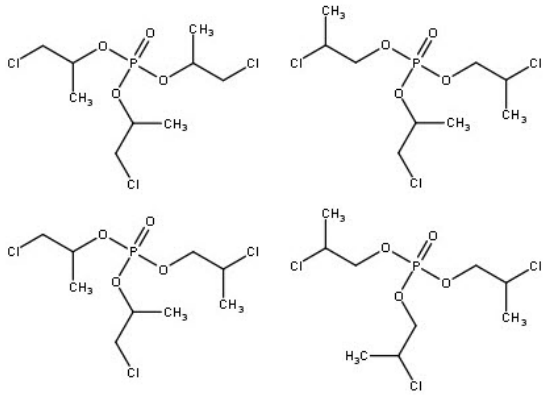
1.1 Other identifiers of the substance

Table 1: Substance identity

EC name (public):	**Reaction products of phosphoryl trichloride and 2-methyloxirane**
IUPAC name (public):	Reaction products of phosphoryl trichloride and 2-methyloxirane
Index number in Annex VI of the CLP Regulation:	
Molecular formula:	C9H18Cl3O4P
Molecular weight or molecular weight range:	327.57
Synonyms:	- Tris(2-chloroisopropyl)phosphate - TCPP

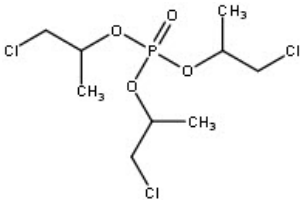
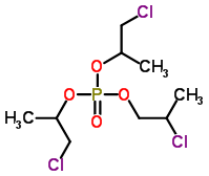
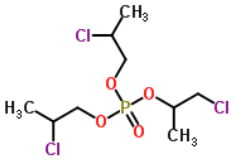
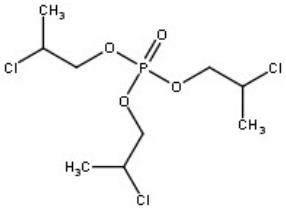
Type of substance ☐ Mono-constituent ☐ Multi-constituent ☒ UVCB

Structural formula:



Above are the structural formulas of the four main components of the registered substance as included in the publicly available registration: Tris(2-chloro-1-methylethyl) phosphate, the main component, and three further isomers: bis(2-chloropropyl)-1-chloro-2-propyl phosphate, bis(1-chloro-2-propyl)-2-chloropropyl phosphate and tris(2-chloropropyl) phosphate.

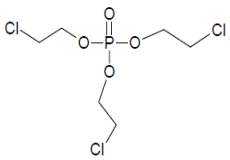
Table: Constituents

Name, CAS number, SMILES	Structural formula
Tris(2-chloro-1-methylethyl) phosphate, TCPP (IUPAC) CAS 13674-84-5 EC 237-158-7 C9H18Cl3O4P	
Bis(1-chloro-2-propyl)-2-chloropropyl phosphate CAS 76025-08-6 C9H18Cl3O4P	
1-chloropropan-2-yl bis(2-chloropropyl) phosphate CAS 76649-15-5 C9H18Cl3O4P	
tris(2-chloropropyl) phosphate CAS 6145-73-9 EC 228-150-4 C9H18Cl3O4P	

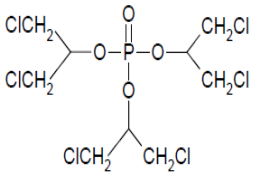
1.2 Similar substances/grouping possibilities

Structural formula:

Tris-(chloroethyl)phosphate (TCEP)



Tris[2-chloro-1-(chloromethyl)ethyl]phosphate (TDCP)



2 OVERVIEW OF OTHER PROCESSES / EU LEGISLATION

Table: Completed or ongoing processes

RMOA	☐ Risk Management Option Analysis (RMOA)	
REACH Processes	Evaluation	☒ Compliance check, Final decision A compliance check decision on the substance EC 911-815-4 was issued in September 2016 which included a request for change of name, on identification of constituents and for a developmental toxicity study. Following this decision, the EC number was updated to the current EC 807-935-0.
		☐ Testing proposal
		☐ CoRAP and Substance Evaluation
	Authorisation	☐ Candidate List
		☐ Annex XIV
	Restri-ction	☒ Annex XVII*
Harmonised C&L	☐ Annex VI (CLP) (see section 3.1)	
Processes under other EU legislation	☐ Plant Protection Products Regulation Regulation (EC) No 1107/2009	
	☐ Biocidal Product Regulation Regulation (EU) 528/2012 and amendments	
Previous legislation	☐ Dangerous substances Directive Directive 67/548/EEC (NONS)	
	☒ Existing Substances Regulation Regulation 793/93/EEC (RAR/RRS)**	
(UNEP) Stockholm convention (POPs Protocol)	☐ Assessment	
	☐ In relevant Annex	

Other processes/ EU legislation	☒ Other (provide further details below)***

*A restriction proposal on " the placing on the market of childcare articles and residential upholstered furniture with PUR foams containing TCEP, TCPP and TDCP. A restriction intention submitted on 06/06/2018 was withdrawn on 19/07/2019 while awaiting hazard data from NTP and is expected to be initiated again in 2022.

**A European Risk Assessment report (under ESR) was published in 2008.

*** The EU Toys Directive 2009/48/EC was amended by 2014/79/EU introducing a specific content limit value of 5 mg/kg (ppm) for each of tris(2-chloro-1-methylethyl) phosphate (TCPP), tris(2-chloroethyl)phosphate (TCEP), and tris[2-chloro-1-(chloromethyl)ethyl] phosphate (TDCP) in toys. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0079&from=EN

*** A group screening of alkyl phosphates, including the present substance under CoRAP, initially launched by the German CA in 2021, was recently handed over to ECHA, as a series of data gaps identified by the German CA prevented conclusion on the need for regulatory down-stream action. ECHA has informed the eMSCA of their plan to assess the regulatory needs for the alkyl phosphates group in the near future and publish the assessment conclusions in 2022.

3 HAZARD INFORMATION (INCLUDING CLASSIFICATION)

3.1 Classification

3.1.1 Harmonised Classification in Annex VI of the CLP

There is no harmonised classification available for TCPP.

3.1.2 Self classification

- In the registration for the substance (EC 807-935-0) covering 45 notifiers, the selfclassification in the C&L Inventory was:

  Acute Tox. 4 H302: Harmful if swallowed

  A further 13 notifiers also self-classify Aquatic tox 3; H412.

3.1.3 Proposal for Harmonised Classification in Annex VI of the CLP

None

4 INFORMATION ON (AGGREGATED) TONNAGE AND USES[1]

4.1 Tonnage and registration status

Table: Tonnage and registration status

From ECHA dissemination site *		
☐ 1 – 10 tpa	☐ 10 – 100 tpa	☐ 100 – 1000 tpa
☐ 1000 – 10,000 tpa	☒ 10,000 – 100,000 tpa	☐ 100,000 – 1,000,000 tpa
☐ 1,000,000 – 10,000,000 tpa	☐ 10,000,000 – 100,000,000 tpa	☐ > 100,000,000 tpa
☐ <1 . . . . . >+ tpa (e.g. 10+ ; 100+ ; 10,000+ tpa)		☐ Confidential
* the total tonnage band has been calculated by excluding the intermediate uses, for details see the Manual for Dissemination and Confidentiality under REACH Regulation (section 2.6.11): https://echa.europa.eu/documents/10162/22308542/manual_dissemination_en.pdf/7e0b87c2-2681-4380-8389-cd655569d9f0		

☒ Industrial use	☒ Professional use	☒ Consumer use	☐ Closed System

The registred UVCB substance Reaction products of phosphoryl trichloride and 2-methyloxirane is used similarly to its its main constituent TCPP are additive flame retardants, i.e. physically mixed with the material being treated rather than chemically bound, as indicated in the EU Risk assessment report (ECHA, 2008[2]).

Prior to the REACH registration of "Reaction products of phosphoryl trichloride and 2-methyloxirane", information from 2000 on the main isomer constituent TCPP showed that over 40,000 tonnes of TCPP were used in the EU in that year , and most of this (> 98%) was used as flame retardant in the production of polyurethane (PUR) for the use in construction (e.g. insulation/ fillers) and furniture. Most TCPP is used in rigid PUR foam (over 80%) mainly for construction applications. The remaining PUR applications are accounted for by flexible foam for automotive applications. However, TCPP has been found in indoor air in cars (ECHA, 2008[2]).

The high tonnage and use of the substance in flexible PUR foam in furniture, rigid insulation foams to exposure through indoor air, including indoor air in cars indicate that the registered substance "reaction products of phosphoryl trichloride and 2-methyloxirane" can be characterised as "widespread" to "wide dispersive" Concern for risk to human health due to the high potential for exposure contributed to the priorisation of the substance for CoRAP.

[1] The dissemination site was accessed in November 2021.

[2] ECHA (2008). EU Risk assessment report – TCPP CAS 13674-84-5, published by ECHA. https://echa.europa.eu/information-on-chemicals/information-from-existing-substances-regulation/-/substance-rev/3270/del/50/col/staticField_-105/type/asc/pre/3/view

5. JUSTIFICATION FOR THE SELECTION OF THE CANDIDATE CoRAP SUBSTANCE

5.1. Legal basis for the proposal

☒ Article 44(2) (refined prioritisation criteria for substance evaluation)

☐ Article 45(5) (Member State priority)

5.2. Selection criteria met (why the substance qualifies for being in CoRAP)

☒ Fulfils criteria as CMR/ Suspected CMR

☐ Fulfils criteria as Sensitiser/ Suspected sensitiser

☒ Fulfils criteria as potential endocrine disrupter

☐ Fulfils criteria as PBT/vPvB / Suspected PBT/vPvB

☒ Fulfils criteria high (aggregated) tonnage (*tpa > 1000*)

☒ Fulfils exposure criteria

☐ Fulfils MS's (national) priorities

5.3 Initial grounds for concern to be clarified under Substance Evaluation

Hazard based concerns		
CMR ☐ C ☐ M ☐ R	Suspected CMR[3] ☒ C ☐ M ☒ R	☒ Potential endocrine disruptor
☐ Sensitiser	☐ Suspected Sensitiser	
☐ PBT/vPvB	☐ Suspected PBT/vPvB	☐ Other (please specify below)

Exposure/risk based concerns		
☒ Wide dispersive use	☒ Consumer use	☐ Exposure of sensitive populations
☐ Exposure of environment	☐ Exposure of workers	☒ Cumulative exposure
☐ High RCR	☒ High (aggregated) tonnage	☐ Other (please specify below)

Human hazard

[3] Suspected CMR: suspected carcinogenic and/or mutagenic and/or reprotoxic properties (not harmonized classification or registrant self-classification for the end-point(s)) according to CLP

There are no data on carcinogenicity in the registration dossier on the substance "Reaction products of phosphoryl trichloride and 2-methyloxirane" or its main components. A concern for carcinogenicity is raised based on i.a. classification of structural analogues TCEP, TDCP , which are both classified as Carc 2 H351. The EU-RAR on the predominant constituent TCPP (ECHA, 2008[4]) considered that there was sufficient information from the structures, physical chemical properties, toxicokinetics and mutagenic profiles of these analogues to support a qualitative read-across on the hazard and risk assessment for the carcinogenicity endpoint for TCPP, despite some differences in the metabolism, target organs and the severity of the effects between the three substances. In addition to these uncertainties, the mechanism of tumour formation in TDCP or TCEP is also not understood. Therefore the eMSCA considers that read across would not be sufficiently robust to conclude on a harmonized classification for carcinogenicity of the registrered substance.

Reports from NTP chronic/carcinogencity studies in rats and mice on Tris(Chloropropyl) Phosphate (TCPP), CAS no 13674-84-5 (same CAS RN as the registrered substance under SEv), are expected to be made available by the end of 2021 (personal communication with NTP, October 2021). The study results are expected to permit evaluation of carcinogenicity of the registered substance under SEv. However, a detailed scrutiny of the details of the protocol and study results is necessary to ascertain that no further data are needed to reach a conclusion on hazard assessment and the possible need for classification of the substance is possible.

From a 2-generation reproductive toxicity study in rats, effects reported on the uterus weight seen in all dosed females in the F0 generation from a LOAEL of 99 mg/kg bw raise concern for fertility due to decreased uterus weight and prolongation of the oestrus cycle. Also, a concern for developmental toxicity is raised due to an increased number of runts observed in all dose groups of F0 generation, and decreases in the mean number of pups delivered in the mid dose group of F1 and the high dose groups of both generations in the same study. The effects may warrant classification as toxic to reproduction to fertility as well as development. A prenatal developmental study in rabbits included in the registration was concluded not to show effects on the developing foetus in that species. The eMSCA has identified a recent PNDT study in rats published by NTP, that is not yet included in the registration. All the available data will be assessed under SEv in order to conclude on the concern or to identify the need for further information.

The endocrine disruption potential of the predominant isomer TCPP was investigated in an *in vitro* study with the H295R cell line where testosterone concentration was increased at 1, 10 and 100 mg/L. Furthermore, data from the 2-generation reproductive toxicity study (described above) indicate hormonal disturbance by TCPP due to the findings concerning decreased uterus weight and also prolongation of the oestrus cycle. The results thus indicate that TCPP could alter the sex hormone balance and may have ED properties. However, it remains to be determined whether increased testosterone level also occurs *in vivo* and whether this could be associated to the decrease in uterus weight. Thus, further verification/studies would be needed to clarify the potential for endocrine disruption of the substance.

5.4 Preliminary indication of information that may need to be requeste to clarify the concern

☒ Information on toxicological properties	☐ Information on physico-chemical properties
☐ Information on fate and behaviour	☐ Information on exposure
☐ Information on ecotoxicological properties	☐ Information on uses
☒ Information ED potential	☐ Other (provide further details below)

5.5 Potential follow-up and link to risk management

☒ Harmonised C&L	☒ Restriction	☐ Authorisation	☐ Other (provide further details)
A restriction proposal on the use of PUR-foam in residential furtniture and child care article is planned by ECHA and the Danish CA. Substance evaluation is needed to clarify the potential hazardous properties of the substance relevant for the restriction proposal. The outcome of substance evaluation may also lead to a proposal for harmonised classification.			

[4] ECHA (2008). EU Risk assessment report – TCPP CAS 13674-84-5, published by ECHA. https://echa.europa.eu/information-on-chemicals/information-from-existing-substances-regulation/-/substance-rev/3270/del/50/col/staticField_-105/type/asc/pre/3/view