Governmental assignment on cleaner flows of plastics

Identify substances which could be problematic in the context of recycling of plastics

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KEMI
Kemikalieinspektionen
Swedish Chemicals Agency

The assignment – cleaner flows of plastics

- A part of the governmental assignment – *Non-toxic from the start*
- Increase the knowledge on problematic substances in plastics. Contribute to the Swedish EPA assignment - *The right plastic in the right place*
- Publish information about problematic substances in plastics in a circular economy on KemI's website, incorporated into existing guidance on recycled materials.
- Improved and expanded material module in PRIO – a tool for substitution – regarding different plastic polymers.

Rapport 3/23: Problematiska ämnen i plast som hindrar återvinning - Kemikalieinspektionen

Problematic substances?

Properties of phase-out substances

- CMR (Category 1A or 1B) +
- Fluorinated greenhouse gases +
- Endocrine disrupting +
- Strongly allergenic (Respiratory sensitising or Skin sensitising in Category 1A) +
- Ozone depleting +
- PBT / vPvB +
- Particularly hazardous metals (mercury, cadmium, lead and their compounds) +
- PFAS, Particularly persistent substances +

and

- Potential PBT/vPvB +

Endocrine disruptor assessment list

ECHA's endocrine disruptor (ED) assessment list includes the substances undergoing an ED assessment that have been brought for discussion to ECHA's ED Expert Group.

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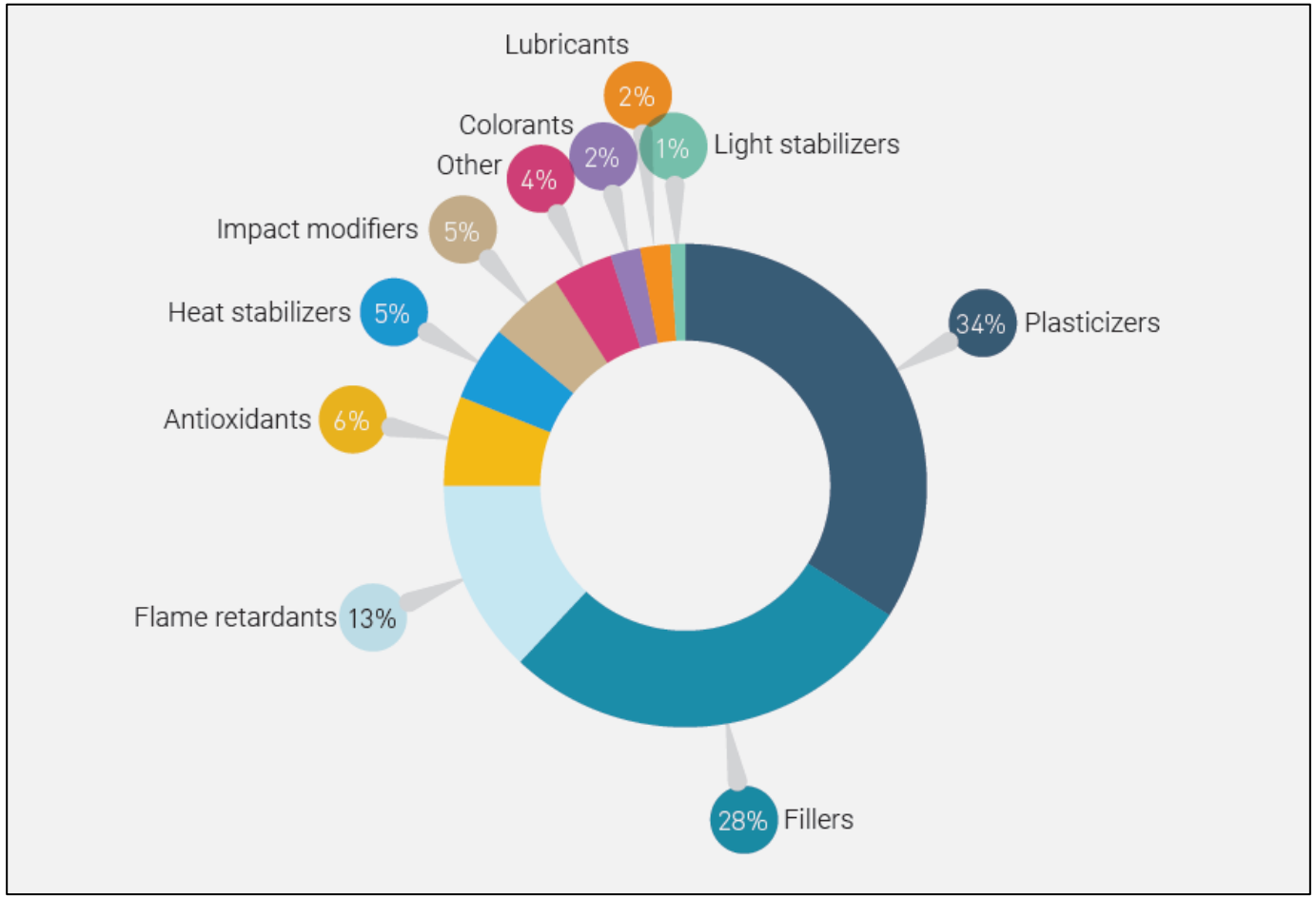
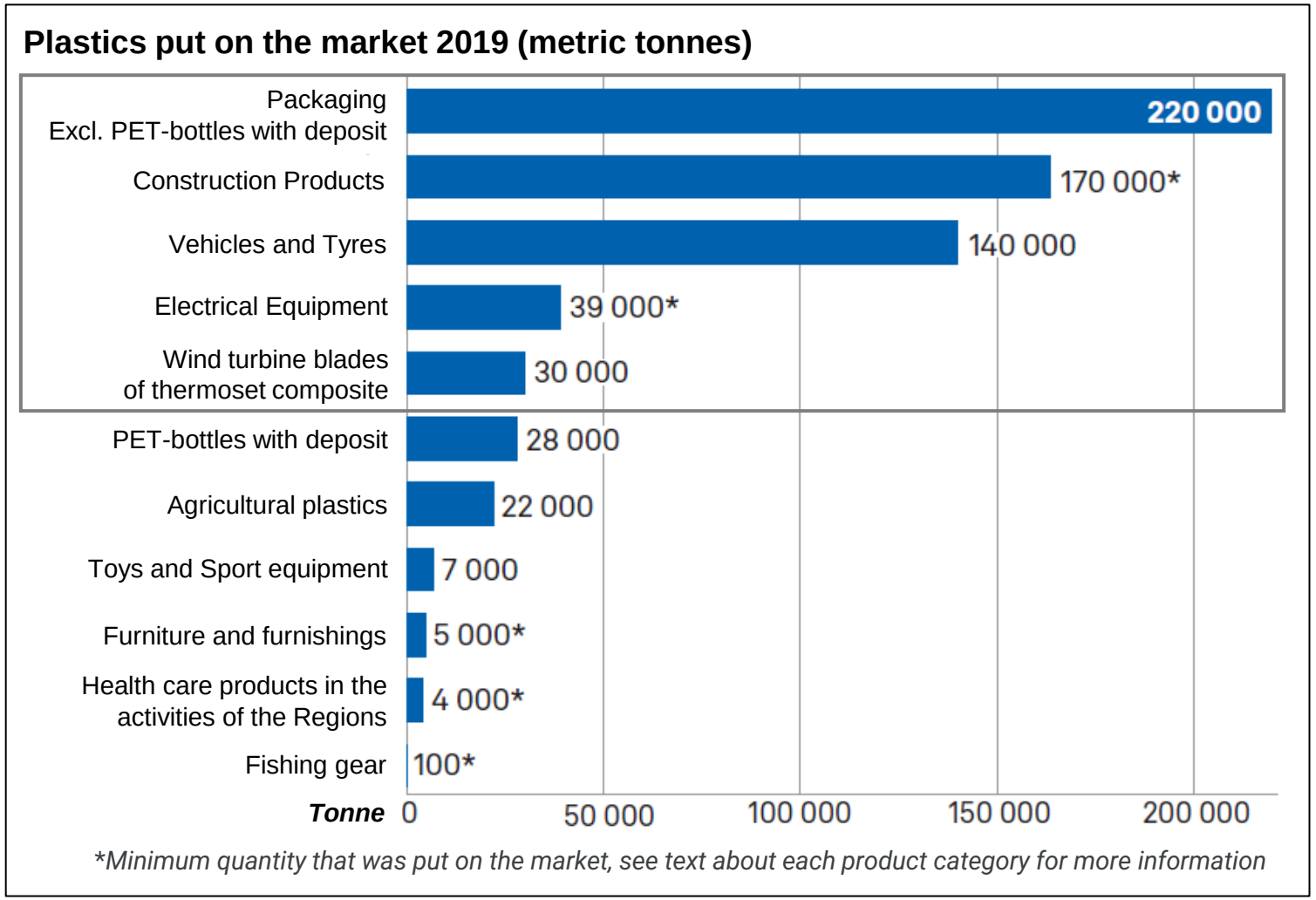
PRIO - a tool for substitution

Share of main additive types in the global plastic production, 2000–2014



Source: Chemicals in plastics: a technical report. UNEP 2023

Plastic flows in Sweden



Source: Plast i Sverige – fakta och praktiska tips, Naturvårdsverket 2022

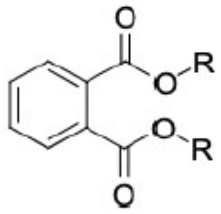
Working procedure

Product categories

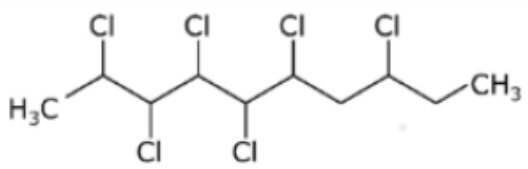
Relevant information on the occurence of problematic substances in different product types of plastics

DEHP + Toxic to reproduction Endocrine disrupting + PVC + Function Softener + Profils och lists + Was used up to 2015

Additives in plastics



Ortoftalat



Details in five Excel files

Example: Flame retardants

CAS nr	EG nr	Ämne	EPA,	PA	sti	O,	ml	ha,	ha,	g fl	Polymer	Produktgrupp, exempel	Produktkategori
Halogenerade													
37853-59-1	253-692-3	1,1'-[Ethane-1,2-diylbisoxy]bis[2,4,6-tribromobenzene] (BTBPE)	x			x					ABS,elastomer,UPE,PC,HIPS(1,4,13)	Höljen(elektriska produkter)(15,R)	Elektronik(15,R)
84852-53-9	284-366-9	1,1'-(Ethane-1,2-diyl)bis[pentabromobenzene] (DPDPE)	x			x		x	x		ABS,klorerad PE,epoxi,HIPS,PA,PBT,PE,PP	Kabel(1,R);skumplast byggkonstruktioner	Bygg(8,10);Elektronik(1,8,10,15,R);Fordon(8,9,R)
97416-84-7	306-832-3	1,1'-(Isopropylidene)bis[3,5-dibromo-4-(2,3-dibromo-2-methylp						x	x		PVC(mjuk),PUR(6)		Fordon(9)
21850-44-2	244-617-5	1,1'-(Isopropylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)b	x					x	x		ABS,HIPS,fenolplast,epoxi,polyolefin(1,1	Höljen(elektriska produkter)(15,R)	Elektronik(8,10,15,R);Fordon(8,9)
32588-76-4	251-118-6	1,2-Bis(tetrabromophthalimido)ethane (EBTBP)	x			x		x	x		elastomer,EPDM,HIPS,PA,PBT,PC,PE,PP,te	Kabel(10);höljen(elektriska produkter)(15	Bygg(10);Elektronik(10,15,R);Fordon(8,9,10)
77-47-4	201-029-3	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-							x				Fordon(8)
117-08-8	204-171-4	1,3-Isobenzofurandione, 4,5,6,7-tetrachloro-							x		epoxi,PUR(4)		
96-23-1	202-491-9	2-Propanol, 1,3-dichloro-							x				
118-79-6	204-278-6	2,4,6-Tribromophenol	x			x			x		epoxi(1)		
1522-92-5	622-370-8	3-Bromo-2,2-bis(bromomethyl)-1-propanol	x			x							
26040-51-7	247-426-5	Bis(2-ethylhexyl) tetrabromophthalate	x			x			x		PVC(mjuk),PUR(skum),termoplastisk elas	Kabel(1,22),tapet(22)	Bygg(22);Elektronik(1,22);Fordon(9)
-	-	Chloroalkanes (SCCP)									PVC(mjuk),elastomer,PUR,akryl(4,10)	PVC-produkter (främst USA)(10);PUR/akry	Bygg,Elektronik(16,R);Fordon(9,16,R);Förpackningar
-	-	Chloroalkanes (MCCP)									PVC(mjuk),PUR,polyester,elastomer(4,6,	Golv,tapeter,kabel(10);PUR-tätningsmed	Bygg,Elektronik(10,R);Fordon(9)
13560-89-9	236-948-9	Dechlorane Plus						x	x		HIPS,LDPE,LLDPE,PA,PBT,PE,PP,klorerad P	Kabel(10)	Bygg(10),Elektronik(8,10);Fordon(8,9)
593-60-2	209-800-6	Ethene, bromo-				x			x		PVC(hård,mjuk)(4)		
-	-	Hexabromocyclododecane (HBCDD)									EPS,XPS,HIPS,PVC(4,10,13,19)	Isolering(skum)(10,R);höljen(elektriska	Bygg,Elektronik(10,16,R);Förpackningar(10,16);Fordo
36355-01-8	252-994-2	Hexabromo-1,1'-biphenyl	x			x					ABS,PUR(skum)(20)	Höljen(elektriska produkter),bilsäten(20)	Elektronik(20);Fordon(9,20,R)
608-71-9	210-167-3	Pentabromophenol	x			x					Epoxi,fenolplast,PUR(skum,hård)(21)		
-	-	Polybrominated diphenylethers (PBDE)									ABS,EPS,HIPS,PA,PBT,PE,PP,epoxi,omätta	Isolering(PS-skum),höljen elektriska	Bygg,Förpackningar(10,16);Elektronik(10,16,R);Fordo
79-94-7	201-236-9	Tetrabromobisphenol A (TBBPA)	x			x		x	x		ABS,epoxi,HIPS,LDPE,LLDPE,HDPE,PC,PP(	Kretskort(12,19);Höljen(elektriska	Bygg,Förpackningar(10,16);Elektronik(10,12,19,R);Fo
Fosforbaserade													
756-79-6	212-052-3	Dimethyl methylphosphonate							x				
18755-43-6	242-555-3	Dimethyl propylphosphonate		x				x	x		PIR/PUR(skum,hård),UPE,epoxi(2,6)		
68937-41-7	273-066-3	Phenol, isopropylated, phosphate (3:1)		x				x	x		PVC(mjuk),PUR(4,6)	Kabel(2)	Elektronik(2),Fordon(8,9)
-	701-337-2	Reaction mass of 3-[(diphenoxyphosphoryl)oxy]phenyl triphen							x				Elektronik,Fordon(8)
-	701-402-5	Reaction mass of dimethyl [3-[(hydroxymethyl) amino]-3-oxopr							x				
-	939-505-4	Reaction mass of p-t-butylphenyldiphenyl phosphate and bis(p-							x				Elektronik,Fordon(8)
1244733-77-4	807-935-0	Reaction products of phosphoryl trichloride and 2-methyloxiran							x				Elektronik,Fordon(8)
359406-89-6	436-230-7	Reaction products of tetrakis(hydroxymethyl)phosphonium chlo							x				
27104-30-9	500-057-6	Tetrakis(hydroxymethyl)phosphonium chloride, oligomeric reac							x				
115-86-6	204-112-2	Triphenyl phosphate (TPP)		x				x	x		ABS,CA,PC/ABS,PPE/HIPS(6,10)		Elektronik(8,10,R);Fordon(8,9)
115-96-8	204-118-5	Tris(2-chloroethyl) phosphate (TCEP)		x					x		CA,epoxi,UPE,PA,PC,PMMA,PUR,PVAc,PV	Takisolering(10);kaffebryggare,mikrovåg	Bygg(10);Elektronik(17,R);Fordon(9,10)
13674-84-5	*237-158-7*	*Tris(2-chloroisopropyl)phosphate (TCPP)*		*x*					*x*		*PUR(10)*	*PUR-skum, ersättare TCEP(10)*	*Elektronik(8);Fordon(8,9)*
13674-87-8	*237-159-2*	*Tris[2-chloro-1-(chloromethyl)ethyl] phosphate (TDCP)*		*x*				*x*	*x*		*PUR(10)*	*PUR-skum, ersättare TCEP(10);höljen(elek*	*Elektronik(R);Fordon(8,9,10)*
126-72-7	204-799-9	Tris(2,3-dibromopropyl) phosphate	x										Fordon(9)

Conclusions

- **Plastic packaging:** Good conditions for material recycling from a chemical perspective.
- **Construction products:** Large amounts of plastic have been built into various buildings since the 1950s. Problematic substances are mainly found in older PVC. There are still some problematic substances in building products on the market.
- **Vehicles and tyres:** Plastic is commonly found in bumpers, underbody guards, dashboards, car seats, electronics and in powertrain components. Several problematic substances occur in vehicles and tyres.
- **Electrical equipment:** The presence of problematic substances varies between different product areas and is often found in old electronics as well as in simpler cheap imported electronics. The substances that are most problematic in electronic plastics are various types of health or environmentally harmful flame retardants.
- **Wind turbine blades:** The primary challenge of recycling wind turbine blades lies in the complex mix of fiberglass, thermosetting resins and thermoplastics that are difficult to separate from each other. PFAS and benzotriazoles are problematic substances from a recycling perspective.

Information on our website – problematic substances in plastics in a circular economy

PET-plast kan tvättas och finfördelas till plastflingor som används för att framställa återvunnet plastmaterial.

Ämnen som kan försvåra återvinning av plast

Innehållsförteckning:

Plast innehåller ofta olika tillsatsämnen. Det är ämnen som tillverkaren blandar i plastmassan för att till exempel göra plasten mjuk, färgad, flamsäker eller hållfast. En del av tillsatserna kan vara farliga för hälsa eller miljö och göra plasten olämplig att återvinna.

I vissa plaster finns nästan inga tillsatser medan det i andra sorters plast kan finnas stora mängder. Du som använder återvunnen plast i varor som du tillverkar, importerar eller säljer behöver veta vilka kemiska ämnen som finns i materialet du ska använda. Enkla plaster med få eller inga tillsatser är ofta lättare och säkrare att återvinna än plast som innehåller mycket tillsatsämnen.

Produktgrupper med plast – att tänka på vid återvinning

Innehållsförteckning:

Förpackningar, byggprodukter, fordon och däck, textilier samt elutrustning. Det är några av de största kategorierna av plastprodukter på marknaden. Du som använder återvunnen plast från de här och andra produktgrupper behöver känna till om materialet kan innehålla farliga ämnen.

I dag återvinns mindre än 10 procent av plasten i Sverige. En av flera orsaker till att inte mer plast återvinns är att vissa plaster innehåller hälso- och miljöfarliga ämnen. I den här artikeln har vi samlat kortfattad information om de vanligaste produktgrupperna av plast och vilka förutsättningar och hinder det finns för återvinning ur ett kemikalieperspektiv.

KEMI Swedish Chemicals Agency | PRIO - a tool for substitution

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News in PRIO > **The material module in PRIO is updated**

The material module in PRIO is up

2023-11-01

Today, the Swedish Chemicals Agency publishes a new report i
hazardous chemicals that hinder material recycling of plastics.
the government assignment *Non-toxic from the start*. The mate
has been updated with new information on hazardous substar
the investigation. The two new sources of material information
Problematiska ämnen i plast som hindrar återvinning and PM
hindrar eller försvårar återvinning av plast i prioriterade produ
byggsektorn.

Rapport 3/23: Problematiska ämnen i plast som hindrar återvinning (in Swedish onl

Material categories

In PRIO, the materials are divided into ten main categories that correspond to the material categories used in the European Chemicals Agency (ECHA) SCIP database (Substances of Concern In Articles as such or in complex objects (Products)). To the SCIP database, suppliers of articles must submit information to Echa on substances of high concern (SVHC), i.e. substances on the Candidate list in the REACH regulation, if present in concentration above 0,1 w/w. The main material categories in PRIO are further divided into subcategories which are not necessarily harmonized with the subcategories in the SCIP database. PRIO further includes an additional main category (Chemical product, material related) which is not used in the SCIP database. Below you will find searchable main categories and their subcategories in PRIO.

Material (main categories)

- Ceramics +
- Chemical product, material related +
- Elastomers +
- Glass +
- Leather +
- Metal +
- Paper, paperboard +
- Plastics −

Searchable subcategories

- Acrylic plastic (e.g. PMMA)

Ways forward (1)

Problematic substances

- Sweden should continue to be a driving force in the EU work regarding:
  - Strengthen the information requirements
  - Evaluate substances and propose authorisations and restrictions for substances of very high concern.
  - Sector-specific enforcement efforts

Different lifetime and requirement profile for different product categories

- Separate guidelines for increased recycling, including information on which substances may be of concern for each product category.

Ways forward (2)

Information and traceability – the key to sustainable circular material flows

- Digital product passports in different product regulations – a new platform for information.
- Improved quality control – more chemical analyses

Better design reduces the amount of problematic substances

- ”Safe and Sustainable by Design” – concept in EU chemicals strategy.
  - The Swedish chemicals agency tool for substitution – PRIO
- Reducing the amount of plastic qualities
  - International standards

Thank you!