

Table I: Hazardous substances in EEE – high priority

ID	Substance name	CAS-Nr.	Hazard	Main use in EEE	Stakeholder Input		
					Specification of use: component(s) in which substance is contained	Quantity	General comments
1	Antimony trioxide	1309-64-4	Carc Cat. 3 R40	Synergist brominated flame retardants;	Molding Compounds		Would require companies to use all "green" molding compounds. If it hasn't been started, this will take time and money. Research and qualifications will have to be done on "green" molding compounds.
2	Antimony compounds	-	Xn; R20/22 N; R51-53	Flame retardant; melting agent in CRT glass; solder material (antimony-tin) Melting agent in CRT glass	Molding Compounds		Would require companies to use all "green" molding compounds. If it hasn't been started, this will take time and money. Research and qualifications will have to be done on "green" molding compounds.
3	Arsenic/arsenic compounds	7440-38-2	T; R23/25 N; R50-53	III-V group semiconductor substrate (GaAs) Flame retardant			
4	Beryllium metal	7440-41-7	Carc. Cat. 2; R49 T+; R26 T; R25-48/23 Xi; R36/37/38 R43	In alloys; copper-beryllium alloy; Connectors: contact springs, improves elasticity of copper alloy; Finger clips PCs: maintains electrical conductivity in metal housing; Monitors Relays: improves properties of copper contact springs Switches: high strength, high conductivity Laser printers: Rotating mirror, lightweight rigidity for precision instrumentation			
5	Beryllium oxide BeO	1304-56-9	Carc. Cat. 2; R49 T+; R26 T; R25-48/23 Xi; R36/37/38 R43	In ceramics, as cooling device; Thermally conductive electrical insulator			
6	Tetrabromo bisphenol A and related compounds (see Table II)	79-94-7	Dangerous to the environment N; R50/53	Flame retardant	Molding Compounds		Would require companies to use all "green" molding compounds. If it hasn't been started, this will take time and money. Research and qualifications will have to be done on "green" molding compounds.
7	Bisphenol A (4,4'-Isopropylidenediphenol)	80-05-7	Repr. Cat. 3; R62 Xi; R37-41 R43	Polycarbonate plastic in electronic devices, medical equipment; in			
8	Diethylhexylphthalate (DEHP)	117-81-7	Repr. Cat. 2; R60-61	Plasticizer in PVC cables			
9	Butylbenzylphthalate (BBP)	85-68-7	Repr. Cat.2; R61 Repr. Cat.3; R62 N; R50-53	Plasticizer in PVC cables			
10	Dibutylphthalate (DBP)	84-74-2	Repr. Cat. 2; R61 Repr. Cat. 3; R62 N; R50	Plasticizer in PVC cables			
11	Diocetylphthalate (DOP)	117-84-0	Dangerous to the Environment	Plasticizer in PVC cables			

12	Dimethylformamide (DMF)	68-12-2	Repr. Cat. 2; R61 Xn; R20/21 Xi; R36	Electrolyte capacitors			
13	Formaldehyde	50-00-0	Carc. Cat. 3; R40 T; R23/24/25 C; R34 R43	Preservatives, monomer (e.g. phenol resin and melamine resin)			
14	Gallium arsenide	1303-00-0	Human carcinogen*	Power amplifiers, semiconductors			
15	Hexabromocyclododecane (HBCDD) and further brominated flame retardants (see table II)	3194-55-6	not (yet) classified in the Annex I of Directive 67/548/EEC; proposal: R33, R64, N R50-53; PBT	Flame retardant			
16	Liquid crystals e.g. MBBA (4-methoxybenzylidene-4-butylaniline); 5CB (4-pentyl-4-cyanobiphenyl)			Electroactive layer in liquid crystal displays of cellular phones, notebooks, PC monitors			
17	Medium-chained chlorinated	85535-85-9		secondary plasticisers in PVC (cable) flame	Shipping Tube End Cap		
18	Nickel[1]	7440-02-0	Carc. Cat. 3; R40 R43	Stainless steel, plating; Decorative metal finishes,			
19	Nonylphenol Nonylphenolpolyglycol ethers (Nonylphenoxyethoxylates)	25154-52-3 9016-45-9	Repr.Cat.3; R62 Repr.Cat.3; R63 Xn; R22 C; R34 N; R50-53	Surfactants, antioxidant in plastics			
20	Perfluorooctane sulfonates[2]	1763-23-1	-				
21	PVC	9002-86-2	Dependent on the additives (stabilizers and plasticizer) used; Dioxin formation during incineration; Source of organic bound chlorine	Sleeve material (of capacitors), cables, tubing films labels and gaskets, insulator, chemical resistance, transparency, sheath material	Shipping Tubes, Shipping Trays,		Not many substitutions for PVC. Is there a PVC that is acceptable? Or are all going to be banned?
22	PCBs Polychlorinated Biphenyls	1336-36-3 and various others	R33 N; R50-53 Dioxin/furan formation during incineration	Flame retardant in PVC plastic cable; capacitors			
23	PCT Polychlorinated Terphenyls	61788-33-8 and various others		Electrical insulation medium, Plasticizers, fire retardants, coatings for electrical wire and cable, dielectric sealants			
24	Polychlorinated Naphthalenes	70776-03-3		lubricant, paint, stabilizer (electric characteristic, flame-resistant, water-resistant) insulator, flame retardant			
25	Selenium	7782-49-2	T; R23/25 R33 R53 Toxic/ Danger of cumulative effects / Environment**	Rectifiers and detector instruments, photoreceptor, semiconductor material, light receiving element, photocell			
26	Short-chained chlorinated	85535-84-8	Carc. Cat. 3; R40 N; R50-53	plasticisers in PVC (cable) flame retardant			
27	Synthetic vitreous fibres	142844-00-6	RCF: Carc. Cat. 2;	Thermal insulation materials in domestic			

	-glass fibres - mineral wool - refractory ceramic fibre (RCFs)			electrical appliances		
28	Tributyl Tin (TBT) compounds Triphenyl Tin (TPT) compounds	various	T; R25-48/23/25 Xn; R21 Xi; R36/38 N; R50-53; T; R23/24/25 N; R50-53	Stabilizer, antioxidant, antibacterial and antifungal agents, antifoulant, antiseptic, antifungal agent, paint, pigment, antistaining		
29	Tributyl Tin Oxide (TBTO)	56-35-9	No classification according to 67/548	antiseptic, antifungal agent, paint, pigment,		
30	dinickel trioxide	1314-06-3	Carc. Cat. 1; R49 R43 R53	May be used as an electrolyte		
31	diarsenic trioxide; arsenic trioxide	1327-53-3	Carc. Cat. 1; R45 T+; R28 C; 34 N; R50-53	May be used in certain glass-materials, less than 5000ppm		
32	4,4'-methylenedi-o-toluidine	838-88-0	Carc. Cat. 2; R45 Xn; R22 R43 N; R50-53	Potential use as a dye		
33	Petrolatum; Petrolatum	08.03.8009	Carc. Cat. 2; R45	Used in solder fluxes/pastes		
34	nickel dihydroxide	12054-48-7	Carc. Cat. 3; R40 Xn; R20/22 R43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		
35	tributyl phosphate	126-73-8	Carc.Cat.3; R40 Xn; R22 Xi; R38	May be present in certain plastics, metallic- or ceramic materials		
36	divanadium pentaoxide; vanadium pentoxide	1314-62-1	Muta. Cat. 3; R68 Repr. Cat. 3; R63 T; R48/23 Xn; R20/22 Xi; R37 N; R51-53	May be present in certain plastics, metallic- or ceramic materials		
37	nickel sulphate	7786-81-4	Carc. Cat. 3; R40 Xn; R22 R42/43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		
38	cobalt oxide	1307-96-6	Xn; R22 R43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials	SmCo Magnets	Are encapsulated Magnets an issue?
39	cobalt	7440-48-4	R42/43 R53	May be present in certain plastics, metallic- or ceramic materials	Magnets	Extremely low chance of human contact.
40	2-ethylhexyl acrylate	103-11-7	Xi; R37/38 R43	2-Ethylhexyl acrylate is used as a monomer in the		
41	Naphthenic acids, copper salts; copper naphthenate	1338-02-9	R10 Xn; R22 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		
42	phenyl bis(2,4,6-trimethylbenzoyl)-	162881-26-7	R43 R53	May be present in certain plastics, metallic- or		
43	thallium	7440-28-0	T+; R26/28 R33 R53	May be present in certain plastics, metallic- or ceramic materials		
44	bromobenzylbromotoluene, mixture of isomers	99688-47-8	Xn; R48/22 R43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		
45	2,2'-(ethylenedioxy)diethyl diacrylate; triethylene glycol diacrylate	1680-21-3	Xi; R36/38 R43	May be used in carton materials		

46	Rosin; colophony [1]	8050-09-7 [1] 8052-10-6 [2] 73138-82-6 [3]	R43	Used in solder fluxes/pastes			
----	-------------------------	---	-----	---------------------------------	--	--	--

Table II: Brominated flame retardants (other than PBBs or PBDEs) (JIG, 2007)

Brominated Flame Retardants (other than PBBs or PBDEs)	CAS Numbers	Hazard	Main use in EEE	Stakeholder Input		
				Specification of use: component(s) in which substance is contained	Quantity	General comments
Brominated flame	-					
Brominated flame	-					
Brominated flame	-					
Brominated flame	-					
Brominated flame	-					
Brominated flame	-					
Poly(2,6-dibromophenylene oxide)	69882-11-7					
Tetra-decabromodiphenoxy-benzene	58965-66-5					
1,2-Bis(2,4,6-tribromophenoxy) ethane	37853-59-1					
3,5,3',5'-Tetrabromobisphenol A (TBBA)	79-94-7			Molding Compound		Would require companies to use all "green" molding compounds. If it hasn't been started, this will take time and money. Research and qualifications will have to be done on "green" molding compounds.
TBBA, unspecified	30496-13-0					
TBBA-epichlorhydrin oligomer	40039-93-8			Molding Compound		Would require companies to use all "green" molding compounds. If it hasn't been started, this will take time and money. Research and qualifications will have to be done on "green" molding compounds.
TBBA-TBBA-diglycidyl-ether oligomer	70682-74-5					
TBBA carbonate oligomer	28906-13-0					
TBBA carbonate oligomer, phenoxy end capped	94334-64-2					
TBBA carbonate oligomer, 2,4,6-tribromo-phenol	71342-77-3					
TBBA-bisphenol A-phosgene polymer	32844-27-2					
Brominated epoxy resin end-capped with	139638-58-7					
Brominated epoxy resin end-capped with	135229-48-0					
TBBA-(2,3-dibromo-propyl-ether)	21850-44-2					
TBBA bis-(2-hydroxy-ethyl-	4162-45-2					
TBBA-bis-(allyl-ether)	25327-89-3					
TBBA-dimethyl-ether	37853-61-5					
Tetrabromo-bisphenol S	39635-79-5					
TBBS-bis-(2,3-dibromopropyl-ether)	42757-55-1					
2,4-Dibromo-phenol	615-58-7					
2,4,6-tribromo-phenol	118-79-6					
Pentabromo-phenol	608-71-9					
2,4,6-Tribromo-phenyl-allyl-	3278-89-5					

Tribromo-phenyl-allyl-ether, unspecified	26762-91-4					
Bis(methyl)tetrabromophthalate	55481-60-2					
Bis(2-ethylhexyl)tetrabromo-2-Hydroxy-propyl-2-(2-hydroxy-ethoxy)-ethyl-TBP	26040-51-7					
TBPA, glycol-and propylene-oxide esters	75790-69-1					
N,N'-Ethylene-bis-(tetrabromo-phthalimide)	32588-76-4					
Ethylene-bis(5,6-dibromonorborene-2,3-	52907-07-0					
2,3-Dibromo-2-butene-1,4-	04.02.3234					
Dibromo-neopentyl-glycol	3296-90-0					
Dibromo-propanol	96-13-9					
Tribromo-neopentyl-alcohol	36483-57-5					
Poly tribromo-styrene	57137-10-7					
Tribromo-styrene	61368-34-1					

Table III: Hazardous substances in EEE already regulated by existing legislation

Substance name	CAS-Nr.	Main use in EEE	Hazard	Key Legal and Regulatory Information	Stakeholder Input		
					Specification of use: component(s) in which substance is contained	Quantity	General comments
Asbestos	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5	Brake lining pad, insulator, filler, abrasive, insulator, filler, pigment, paint, talc, adiabatic material	Carc. Cat. 1; R45 T; R48/23	76/769/EEC, Marketing and Use of Dangerous Substances and amendments: (83/478/EEC; 85/610/EEC; 87/217/EEC; 91/659/EEC; 99/77/EEC)			
Specific Azocolourants and azodyes (which form certain aromatic amines)	Various	Pigment, dyes, colorants		76/769/EEC, Marketing and Use of Dangerous Substances and amendments: (2002/61/EC; 2003/03/EEC).			
Ozone Depleting Substances and Hydrochlorofluorocarbons	Various	Refrigerant , foaming agent , insulation , extinguishant		Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer			

[1]

Only in those applications where nickel is likely to result in direct and prolonged skin exposure

[2]

iRestriction does not apply to the following applications or processes: 1) photoresists or antireflective coatings for photolithography processes; 2) photographic coatings applied to films, papers, or printing plates; 3) mist suppressants for non-decorative hard chromium (VI) plating; 4) wetting agents for use in controlled electroplating systems