

List of REACH Allergens

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Mit der neuen europäischen REACH (Registration Evaluation Authorisation Chemikalien)-Verordnung sollen die Risiken insbesondere für krebserregende, mutagene und fortpflanzungsgefährdende Stoffe (CMR) sowie im ökologischen Sinne für PBT (Persistent Bioaccumulative Toxic) und vPvB (very Persistent very Bioaccumulative) erkannt und damit eine Minimierung der Gefahren für Mensch und Umwelt erreicht werden können.

In den bisherigen politischen Verfahren zeigt sich, dass die Belange der Allergiker und Chemikalien-sensiblen Risikogruppen nicht ausreichend berücksichtigt werden. Deswegen wird vom AVE in Zusammenarbeit mit KEAC eine REACH-Arbeitsgruppe eingesetzt mit dem Ziel, eine Stoffliste potentieller Allergene zu erstellen. Diese soll bei der (Risiko)-Bewertung innerhalb des REACH-Verfahrens und nach außen für die Öffentlichkeit Berücksichtigung finden. Hierbei spielen die Gewährleistung von Transparenz und Validierung der zu verwendenden Prüfverfahren eine entscheidende Rolle. Eine Forderung der NGOs ist, hiermit die Risikokommunikation sicher zu stellen.

Weitere Forderungen:

- Zertifizierungs- und Sicherheitsgutachten (CSR) sind ab > 1 Jato vorzulegen
- Ausreichende Qualitätssicherung bei Stoffen mit Verdacht auf Allergenität - insbesondere neuen Stoffen. Hierzu sind auch Zwischenprodukte zu zählen
- Aufnahme von bevorzugt ex vivo/in vitro-Tests in Bezug auf die Allergenitätsprüfungen
- Erstellung von Datenbanken nach dem Vorbild von „Protall“ und „Informall“ für alle Chemikalien: Umfassende Informationspflicht der zur Verfügung stehenden Daten und allgemeine Zugangsberechtigung
- Bei Selbsteinstufungsprozessen der Chemikalien durch die Industrie bzw. Hersteller überprüfbar und nachvollziehbare CL (classification labeling)

Heerlen (NL), 29. October 2005

Beschluss des AVE (Allergie-Verein in Europa e.V.) in Zusammenarbeit mit KEAC (Klinisch Ecologisches Allergie Centrum)

The actual REACH policy indicates carcinogenic, mutagenic, teratogenic and bio accumulative substances. Furthermore, the development and the use of more and more new, but also many of the old chemicals are responsible for further sustain increase of allergic diseases. The prevalence of those diseases in Europe encloses 20 % of the population and is still increasing. Socio-economic costs which were created by this are calculated e.g. 1997 circa 29.000.000.000 € and are aggravating in the meantime (1, 2). We are claiming to stop this man-made process in favour for the health of allergic people. To avoid allergens the following list of chemicals must be included in the registration assessment and must be labelled independently on the concentration in the trade products. There are no available threshold values of allergens to date. In many cases only traces of allergens can cause allergic diseases at the skin and/or respiratory tract.

Following the resolution of the AVE e.V. anniversary meeting in Heerlen (NL) in 2005 a common task force commission was found together with KEAC. The aim of this commission (Prof. *Diel*, Dr. *Fischer*, Dr. *Kamsteeg*, Prof. *Schubert*, Dr. *Weber*) is to prepare an allergen list, which shall be used as a basic recommendation for sensitizing risk assessment in the REACH product registration.

Our list does not include single sensitizing biological materials like allergenic plants, mushrooms and enzymes. Before distributing in the downstream use we demand the examination of any product related to its allergenic/sensitizing potency. This is also true for products < 1 year-ton in concern to the need of labelling.

We recommend to use the Murine Local Node Assay (LLNA), the Lymphocyte Stimulation Test (LST) combined with the Basophil Degranulation Test (BDT) as a human screening method (3,4,5,6).

Indication of the potential allergens symbols (pictograms) or clear-cut abbreviations can be used, in the English or individual country language.

In the following there is the draft of a not complete substance list related to publications of

- the German DFG: MAK- and BAT-Werte-Liste (2005) (7),
- AGOEF: Orientierungswerte für Inhaltsstoffe von Raumluft und Hausstaub (2004) (8),
- *Diel et al.*: Criteria for allergenic building materials (2003) (9),
- *Kayser D, Schlede E* (eds.): Chemikalien und Kontaktallergie BgVV (2001) (10),
- furthermore, TRGS 540 Anlagen von 1997¹ just as the European Council Directive 2003/15/EC from 2003².

The listed allergens are predominantly “contact allergens” Type IV (*Gell and Coombs* 1963). It has to be taken in consideration that big molecules or reactive substances like formaldehyde can also cause a sensitization risk (Type I). Nevertheless CAS numbers and literature is indicated. Only the allergens of the category A are listed related to the allergen list of *Kayser* and *Schlede*. (BGVV 2001) These substances are defined to be “important contact allergens”, which have been found to be very effective in human and animal experiments responding contact allergic symptoms even at low concentration exposure.

As far as it is outlined by the „Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe (DFG)“ symbols are defined „Sh or Ss“ = skin sensitizing substance, „Sa or Sr“ = respiratory organ sensitizing, „Sah or Srs“ = sensitizing both respiratory system and skin „SP“ = photo-contact sensitizing substance.

Adjuvant and synergists are not considered. This is true also for cell membrane effective bipolar chemicals like piperonylbutoxide (PBO) frequently used in combination with pyrethroids. Cross over identifications concerning “cross-activity” are also ignored and can be studied in *Kayser* and *Schlede*. (2001) Furthermore, cytokine responding factors, which influence the T helper lymphocyte (Th1/Th2)-balance are also excluded.

The presented chemical list is not complete and needs continuing up-date.

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Allergens	CAS-Nr.	Remarks
Abietic acid	514-10-3 (Sh)	MAK-list 2005
Acrylonitrile	107-13-1 (Sh)	MAK-list 2005
Acrylic Resins, not cured	(Sh)	TRGS 540, encl 4
Alantolactone	546-43-0 (Sh)	BgVV 2001
Alkaline persulfate	(Sah)	MAK-list 2005
α-Amyl cinnamic aldehyde	122-40-7 (Ss)	Directive 2003/15/EC and MAK-list 2005
Allyl glycidyl ether (1-Allyloxy-2,3-epoxypropane)	106-92-3 (Sh)	MAK-list 2005
Amino hardeners	(Ss)	TRGS 540, encl 4
p-Aminoazo benzene	60-09-3 (Sh)	BgVV 2001
o-Aminoazo toluene	97-56-3 (Sh)	MAK-list 2005
p-Aminoazo toluene	41576-40-3 (Sh)	BgVV 2001
p-Aminobenzoic acid	150-13-0 (Sh, SP)	BgVV 2001
2-Amino-5-diethylaminotoluene monohydrochloride	2051-79-8 (Sh)	BgVV 2001
p-Amino diphenylamine (N-Phenyl-p-phenylenediamine)	101-54-2 (Sh)	TRGS 907
2-Amino ethanol (Ethanolamine, H-Glycinol)	141-43-5 (Sh)	MAK-list 2005
3-Amino phenol	591-27-5 (Sh)	AVE 2005
4-Amino phenol	123-30-8 (Sh)	MAK-list 2005
Ammonium tetra chloroplatinate	(Sah)	TRGS 540, encl 2, TRGS 907, obligatory sensitizer
Ammonium persulfate	7727-54-0 (Sah)	TRGS 907 and MAK-list 2005
Ammonium thioglycolate	5421-46-5 (Sh)	TRGS 907
n-Amylcinnamicyl alcohol	101-85-9 (Ss)	Directive 2003/15/EC
p-Anisyl alcohol (4-Methoxy benzyl alcohol)	105-13-5 (Ss)	Directive 2003/15/EC
1,2-Benzisothiazol-3(2H)-one	2634-33-5 (Sh)	MAK-list 2005
Benzocaine (Ethyl 4-aminobenzoate)	94-09-7 (Ss)	BgVV 2001
1,4-Benzoquinone	106-51-4 (Sh)	MAK-list 2005
Benzylalcohol (poly)hemiformal	14548-60-8 (Sh)	MAK-list 2005
Benzyl alcohol	100-51-6 (Ss)	Directive 2003/15/EC
Benzylidene acetone	122-57-6 (Ss)	AVE 2005
Benzyl benzoate	120-51-4 (Ss)	Directive 2003/15/EC
Benzyl salicylate	118-58-1 (Ss)	Directive 2003/15/EC
Beryllium and its compounds	7440-41-7 (Sah)	MAK-list 2005
1,3-Bis-(hydroxymethyl)-5,5-dimethylhydantoin	6440-58-0 (Sh)	MAK-list 2005
Bisphenol A (4,4'-Isopropylidenediphenol)	80-05-7 (SP)	MAK-list 2005
Bisphenol A-bis-(2-hydroxypropyl) methacrylate	1565-94-2 (Sh)	MAK-list 2005
Bithionol (2,2'-Thio-bis-(4,6-dichlorophenol))	97-18-7 (SP)	MAK-list 2005
Bromelain	9001-00-7 (Sa)	MAK-list 2005
1-Bromopentadecane	629-62-9 (Sh)	AVE 2005
2-Bromo-4'-nitroacetophenon	99-81-0 (Srs)	BgVV 2001

Allergens	CAS-Nr.	Remarks
2-Bromo-2-nitro-1,3-propanediol	52-51-7 (Sh)	MAK-list 2005
Bromosulfone	(Sh)	AVE 2005
1,4-Butanediol diacrylate	1070-70-8 (Sh)	MAK-list 2005
1,4-Butanediol diglycidyl ether	2425-79-8 (Sh)	BgVV 2001
2-(4-tert-Butylbenzyl) propionaldehyde	80-54-6 (Ss)	Directive 2003/15/EC
2-Butanone oxime	96-29-7 (Sh)	MAK-list 2005
But-2-yne-1,4-diol	110-65-6 (Sh)	MAK-list 2005
n-Butyl acrylate	141-32-2 (Sh)	MAK-list 2005
tert-Butyl acrylate	1663-39-4 (Sh)	MAK-list 2005
tert-Butyl glycidyl ether	7665-72-7 (Sh)	MAK-list 2005
n-Butyl glycidyl ether	2426-08-6 (Sh)	MAK-list 2005
p-tert-Butylpyrocatechol (TBC)	98-29-3 (Sh) and 27213-78-1 (Sh)	MAK-list 2005
n-Butyl methacrylate	97-88-1 (Sh)	MAK-list 2005
p-tert-Butylphenol	98-54-4 (Sh)	MAK-list 2005
d,l-Camphor	76-22-2 (Sa)	AGOEF 2004
Carabron	1748-81-8 (Sah)	BgVV 2001
N-Carboxy-anthranilic acid anhydride	118-48-9 (Sh)	MAK-list 2005
Δ3-Carene (3,7,7-trimethyl bicyclohept-3-ene) and oxidation products	13466-78-9 (Sh) and 498-15-7 (Sah)	BgVV 2001 and AGOEF 2004
Castor proteins	(Sa)	MAK-list 2005
Chloramphenicol (D(-)-threo-2,2-Dichloro-N-[beta-hydroxy-alpha-(hydroxy-methyl)-p-nitrophenylethyl] acetamide)	56-75-7 (Sh)	TRGS 540
2-Chloroacetamide	79-07-2 (Sah)	BgVV 2001 and TRGS 907
2-Chloroacetophenone	532-27-4 (Sh)	BgVV 2001
3-Chloroaniline	108-42-9 (Sh)	MAK-list 2005
3-(2-Chloropheno)thiazin-10-yl)-N,N-dimethylpropan-1-amine	(Sh)	TRGS 907
Chloropromazin hydrochloride	69-09-0 (Sh, SP)	TRGS 907
Chloropromazine	50-53-3 (SP)	TRGS 907 and MAK-list 2005
Chloroacetic acid methyl ester (Methyl chloroacetate)	96-34-4 (Sh)	MAK-list 2005
p-Chloro-m-cresol	59-50-7 (Sh)	MAK-list 2005
Chlormethyl benzofurane	(Sh)	AVE 2005
5-Chloro-2-methyl-2H-diisothiazol-3-one and 2-Methyl-2H-diisothiazol-3-one Mixture in relation 3:1	26172-55-4 (Ss) and 2682-20-4 (Sh) (Sh)	TRGS 907 and MAK-list 2005
2-Chloro-N-(2-chloroethyl)-N-methylethanamine	51-75-2 (Sh)	MAK-list 2005
Chlormethyl triazolinone	(Sh)	AVE 2005
Chlorothalonil	1897-45-6 (Sh)	MAK-list 2005
Chromium(III)-compounds, watersoluble	(Sh)	AVE 2005
Chromium(VI)-compounds, watersoluble	7778-50-9 (Ss)	
Chromium(VI)-compounds	18540-29-9 (Sh)	MAK-list 2005
Cinnamic alcohol	104-54-1 (Ss)	Directive 2003/15/EC and MAK-list 2005

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Allergens	CAS-Nr.	remarks
Cinnamic aldehyde (Cinnamal)	104-55-2 (Ss)	Directive 2003/15/EC and MAK-list 2005
Citral (3,7-dimethylocta-2,6-dienal)	5392-40-5 (Ss)	Directive 2003/15/EC
Citronellol (3,7-dimethyloct-6-en-1-ol)	106-22-9 (Ss)	Directive 2003/15/EC and AGOEF 2004
Cobalt and its compounds	(Sah)	MAK-list 2005
- Cobalt metal	7440-48-4	MAK-list 2005
- Cobalt(II)carbonate	513-79-1	MAK-list 2005
- Cobalt(II)oxide	1307-96-6	MAK-list 2005
- Cobalt(II,III)oxide	1308-06-1	MAK-list 2005
- Cobalt(II)sulfate-7H ₂ O and similar soluble salts	10026-24-1	MAK-list 2005
- Cobalt(II)sulfide	1317-42-6	MAK-list 2005
Colophony	8050-09-7 (Sh)	TRGS 540, encl 4 and MAK-list 2005
Costunolide (3,7-dimethyl-11-methylidene-13-oxabicyclo[8.3.0]trideca-2,6-dien-12-one)	553-21-9 (Sh)	BgVV 2001
Coumarin (chromen-2-one)	91-64-5 (Ss)	Directive 2003/15/EC
Cyanamid	420-04-2 (Sh)	MAK-list 2005
N-Cyclohexyl-2-benzothiazolsulfenamide	95-33-0 (Ss)	BgVV 2001
Desoxylapachol (2-(3-methylbut-2-enyl) naphthalene-1,4-dione)	3568-90-9 (Ss)	BgVV 2001
1,5-Diaminonaphthalene	2243-62-1 (Sh)	MAK-list 2005
4,4'-Diaminodiphenyl ether (4,4'-Oxydianiline)	101-80-4 (Sh)	MAK-list 2005
4,4'-Diaminodiphenylmethane (MDA), 4,4'-Methylenedianiline)	101-77-9 (Ss)	MAK-list 2005
1,2-Dibromo-2,4-dicyanobutane (Methyldibromoglutaronitril)	35691-65-7 (Sh)	TRGS 907 and MAK-list 2005
Dicarbon acid anhydride	(Sah)	TRGS 540, encl 2
3,4-Dichloroaniline	95-76-1 (Sh)	MAK-list 2005
4,5-Dichloro-2-methyl-3(2H)-isothiazolone	26542-23-4 (Sh)	BgVV 2001
Dichlorophen	97-23-4 (Sh)	BgVV 2001
1,3-Dichloropropene (mixture of isomers)	542-75-6 (Sh)	MAK-list 2005
Dicyclohexylcarbodiimide (DCC)	538-75-0 (Sh)	MAK-list 2005
Dicyclohexylmethane-4,4'-diisocyanate (HMDI)	5124-30-1 (Sah)	AVE 2005
Dicyclopentamethylthiuram disulfide (DPTD)	94-37-1 (Sh)	TRGS 540, encl 4 and BgVV 2001
Diethanolamine	111-42-2 (Sh)	MAK-list 2005
N,N-Diethyl-p-phenylenediamine	93-05-0 (Sh)	BgVV 2001
Diethylene glycol diacrylate	4074-88-8 (Sh)	MAK-list 2005
Diethylene glycol dimethacrylate	2358-84-1 (Sh)	MAK-list 2005
Diethylenetriamine	111-40-0 (Sh)	MAK-list 2005
Diglycidyl resorcinol ether	101-90-6 (Sh)	MAK-list 2005
3,4-Dihydrocoumarin	119-84-6 (Sh)	AVE 2005
Diisocyanates, aliphatic	(Srs)	AVE 2005
(R)-3,4-Dimethoxydальbergion	3755-64-4 (Sh)	BgVV 2001

Allergens	CAS-Nr.	Remarks
N,N'-Dimethylcarbamyl chloride	79-44-7 (Sh)	MAK-list 2005
1,1-Dimethylhydrazine	57-14-7 (Sh)	MAK-list 2005
1,2-Dimethylhydrazine	540-73-8 (Sh)	MAK-list 2005
1,2-Dimethylol-4,5-dihydroxyethylenurea	1854-26-8 (Sh)	MAK-list 2005
2,4-Dinitrochlorobenzene (DNCB)	97-00-7 (Sh)	BgVV 2001, MAK-list 2005, obligatory sensitizer
Dipentene (see limonene)	138-86-3 (Ss)	Directive 2003/15/EC
Diphenylcyclopropenone (for Diphenacylon - DCP)	886-38-4 (Ss)	BgVV 2001, obligatory sensitizer
N,N'-Diphenyl-p-phenylenediamine (DPPD)	101-87-1 (Ss)	BgVV 2001
Diphenylmethane-4,4'-diisocyanate (MDI)	101-68-8 (Sah)	TRGS 540, encl 2 and MAK-list 2005
N,N'-Diphenyl-p-phenylenediamine	74-31-7 (Ss)	BgVV 2001
Dithio-2,2'-bis(benzmethylamide)	2527-58-4 (Sh)	MAK-list 2005
Dithiocarbamate		TRGS 540, encl 4
Dyes		
- Direct Red 80	2610-10-08 (Sh)	AVE 2005
- Disperse Blue 106	12223-01-7 (Sh)	AVE 2005
- Disperse Blue 124	61951-7 (Sh)	AVE 2005
- Quinoline Yellow SS (D&C Yellow No. 11)	8003-22-3 (Sh)	BgVV 2001
Epichlorohydrin (1-Chloro-2,3-epoxy propane)	106-89-8 (Sh)	BgVV 2001 and MAK-list 2005
Epoxid resin DGEBA-Base, not tempered	1675-54-3 (Sh)	TRGS 540, encl 4
Epoxid resin DGEBF-Base, not tempered	9003-36-5 (Sh)	TRGS 540, encl 4
Epoxid resin, cycloaliphatic, not tempered		TRGS 540, encl 4
Ethyl acrylate	140-88-5 (Sh)	MAK-list 2005
1,2-Ethylene diamine	107-15-3 (Sah)	BgVV 2001 and MAK-list 2005
Ethylen glycol dimethacrylate	97-90-5 (Sh)	MAK-list 2005
2-Ethyl hexyl acrylate	103-11-7 (Sh)	MAK-list 2005
Ethyl methacrylate	97-63-2 (Sh)	MAK-list 2005
Eugenol (2-Methoxy-4-prop-2-enyl-phenol)	97-53-0 (Ss, Sh)	Directive 2003/15/EC, MAK-list 2005 and AGOEF 2004
Enzymes		TRGS 540, encl 2
Farnesol (3,7,11-Tri-methyl-dodeca-2,6,10-trien-1-ol)	4602-84-0 (Ss)	Directive 2003/15/EC and MAK-list 2005
1-Fluoro-2,4-dinitrobenzene	70-34-8 (Sah)	BgVV 2001, obligatory sensitizer
Formaldehyde	50-00-0 (Sah)	TRGS 540, encl 4 and MAK-list 2005
Geraniol ((2E)-3,7-Dimethyl-2,6-octadien-1-ol)	106-24-1 (Ss)	Directive 2003/15/EC and MAK-list 2005
Geranyl benzoquinone (2-(3,7-Dimethylocta-2,6-dienyl)cyclohexa-2,5-diene-1,4-dione)	61977-06-8 (Sah)	BgVV 2001

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2-Geranylgeranyl-1,4-dihydroxybenzene	39703-09-8 (Sah)	BgVV 2001
2-Geranylhydroquinone (Geroquin ol)	10457-66-6 (Sah)	BgVV 2001
Glutaraldehyde	111-30-8 (Sah)	BgVV 2001, TRGS 540, encl 4 and MAK-list 2005
Glyceryl thiomonoglycolate	30618-84-9 (Sh)	BgVV 2001, TRGS 540, encl 4 and MAK-list 2005
Glyceryl thioglycolate	30618-84-9 (Sh)	TRGS 540, TRGS 907 and MAK-list 2005
Glycidyl trimethyl ammonium chloride	3033-77-0 (Sh)	MAK-list 2005
Glyoxal	107-22-2 (Sh)	MAK-list 2005
Gold and its organic compounds	7440-57-5 (Sh)	MAK-list 2005
Helenalin	6754-13-8 (Sh)	BgVV 2001
Hexahydrophthalic anhydride	85-42-7 (Sa)	TRGS 540, encl 2 and MAK-list 2005
Hexahydro-1,3,5-tris (2-hydroxyethyl)-s-triazine	4719-04-4 (Sh)	TRGS 907 and MAK-list 2005
1,6-Hexamethylene diacrylate	13048-33-4 (Sh)	MAK-list 2005
Hexamethylene-1,6-diisocyanate (HDI)	822-06-0 (Sah)	TRGS 540, encl 2 and MAK-list 2005
1,6-Hexanediol diglycidyl ether	16096-31-4 (Sah)	AVE 2005
α -Hexylcinnamic aldehyde (Hexyl cinnamal)	101-86-0 (Ss)	Directive 2003/15/EC
Hydrazine	302-01-2 (Sh)	MAK-list 2005
Hydrazine hydrate and hydrazine salts	7803-57-8 (Sh)	MAK-list 2005
Hydrazinthioglycolat (2-Sulfanylethanhydrazide)	760-30-5 (Ss)	BgVV 2001
7-Hydroxycitronellol (7-hydroxy-3,7-dimethyl-octanal)	107-75-5 (Sh)	MAK-list 2005
Hydroxyethyl acrylate	818-61-1 (Sh)	MAK-list 2005
2-Hydroxyethyl methacrylate	868-77-9 (Sh)	MAK-list 2005
Hydroxylamine and its salts	7803-49-8 (Sh)	MAK-list 2005
Hydroxymethylpentylcyclohexancarboxaldehyd (Lyral) = Hydroxyisohexyl-3-cyclohexene carboxaldehyde	31906-04-4 (Ss)	Directive 2003/15/EC and MAK-list 2005
N-Hydroxy-methyl chloroacetamide	2832-19-1 (Sh)	MAK-list 2005
Hydroxypropyl acrylate (all isomeres)	25584-83-2 (Sh)	MAK-list 2005
2-Hydroxypropyl methacrylate	923-26-2 (Sh)	MAK-list 2005
α -Ionon (4-(2,6,6-trimethyl-1-cyclohex-2-enyl)but-3-en-2-one)	127-41-3	AGOEF 2004
Isoalantolactone (Hydroxyisohexyl-3-cyclohexene carboxaldehyde)	470-17-7 (Sh)	BgVV 2001
Isocyanates	(Sa)	AVE 2005
4-Isopropyl-dibenzoylmethane	63250-25-9 (Sh)	BgVV 2001

Allergens	CAS-Nr.	Remarks
N-Isopropyl-N'-phenyl-4-phenylenediamine (IPPD)	101-72-4 (Sh)	BgVV 2001
3-Iodo-2-propinyl butyl-carbamate	55406-53-6 (Sh)	MAK-list 2005
Isoeugenol (2-Methoxy-4-prop-1-enyl-phenol)	97-54-1 (Ss)	Directive 2003/15/EC, MAK-list 2005 and AGOEF 2004
- E-Isoeugenol	5932-68-3	MAK-list 2005
- Z-Isoeugenol	5912-86-7	MAK-list 2005
A-Isomethyl Ionone ((3-Methyl-4-(2,6,6-trimethylcyclohex-2-en)but-3-en-2-one))	127-51-5 (Ss)	Directive 2003/15/EC
Isophorone diamine (3-(Aminomethyl)-3,5,5-trimethyl-cyclohexan-1-amine)	2855-13-2 (Sh)	TRGS 540, encl 4 and MAK-list 2005
Isophorone diisocyanate (5-Isocyanato-1-(isocyanato-methyl)-1,3,3-trimethyl-cyclohexane)	4098-71-9 (Sah)	MAK-list 2005
4-Isopropyl phenylisocyanate	31027-31-3 (Sh)	MAK-list 2005
Latex proteine, latex containing powder	(Sah)	TRGS 540, encl 2 and 4
d,l-Limonene (1-Methyl-4-prop-1-en-2-yl-cyclohexene) and similar mixtures	138-86-3 (Sh)	MAK-list 2005
- d-Limonene	5989-27-5 (Ss)	Directive 2003/15/EC and MAK-list 2005
- l-Limonene	5989-54-8 (Sh)	MAK-list 2005 and AGOEF 2004
Linalool (3,7-Dimethylocta-1,6-dien-3-ol)	78-70-6 (Ss)	Directive 2003/15/EC
Lauryl gallate (dodecyl 3,4,5-trihydroxybenzoate)	1166-52-5 (Sh)	AVE 2005
Laurel oil (see Oil of Laurel)	8002-41-3 8002-97-0	BgVV 2001
Maleic anhydride	108-31-6 (Sah)	TRGS 540, encl 2 and MAK-list 2005
Maneb (1,2-Ethanediylbis (carbomodithioato) (2)-manganese)	12427-38-2 (Sh)	MAK-list 2005
Mansonone A (3,8-Dimethyl-5-propan-2-yl-5,6,7,8-tetrahydronaphthalene-1,2-dione)	7715-94-8 (Sh)	BgVV 2001
Merbromin	129-16-8 (Sh)	MAK-list 2005
Mercapto benzothiazole	149-30-4 (Sh)	MAK-list 2005
Mercury and its organic compounds	7439-97-6 (Sh)	MAK-list 2005
Mercury (organic compounds)	22967-92-6(Sh)	TRGS 907, BgVV 2001 and MAK-list 2005
Mercury ammonium chloride	33445-15-7 (Sh)	AVE 2005
Mercury (II) chloride (Sublimate)	7487-94-7 (Sh)	AVE 2005
- Merthiolate (Thimerosal)	54-64-8 (Sh)	AVE 2005
Metam-Sodium (Methyliminomethanedithiol)	137-42-8 (Sh)	AVE 2005
Methenamine (Hexamethylene tetramine)	100-97-0 (Sh)	MAK list 2005

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Allergens	CAS-Nr.	Remarks
1-(p-Methoxyphenyl)-1-penten-3-one	104-27-8 (Ss)	AVE 2005
Methyl acrylate	96-33-3 (Sh)	MAK-list 2005
Methylchloro isothiazolinone (MCI)	26172-55-4 (Sh)	BgVV 2001
Methyl-2-cyanoacrylate	137-05-3 (Sh)	TRGS 540, encl.4
N,N'-Methylene bis(5-methyloxazolidine)	66204-44-2 (Sh)	MAK-list 2005
4,4'-Methylenedianiline	101-77-9 (Sh)	MAK-list 2005
Methyl heptin carbonate (Metyl-2-octynoate)	111-12-6 (Ss)	Directive 2003/15/EC
Methyl hydrazine	60-34-4 (Sh)	MAK-list 2005
Methyl isocyanate	624-83-9 (Sh)	MAK-list 2005
Methyl isothiocyanate (MITC)	556-61-6 (Sh)	TRGS 907
2-Methyl-4-isothiazolin-3-one (MI)	2682-20-4 (Sh)	BgVV 2001
Methyl methacrylate	80-62-6 (Sh)	TRGS 540, encl 4, MAK-list 2005 and AGOEF 2004
Methyltetrahydrophthalic acid anhydride	11070-44-3 (Sa)	MAK-list 2005
N-Methyl-2,4,6-N-tetranitroaniline (Tetryl)	479-45-8 (Sah)	BgVV 2001 and MAK-list 2005
Methyl vinyl ketone (But-3-en-2-one)	78-94-4 (Sh)	MAK-list 2005
Musk ambrette (synthetic)	83-66-9 (Ss, SP) 123-69-3	BgVV 2001
1-Naphthol	90-15-3 (Sh)	AVE 2005
Naphthol AS (3-Hydroxy-N-phenyl-naphthalene-2-carboxamide)	92-77-3 (Ss)	BgVV 2001
1,5-Naphthylene diisocyanate	3173-72-6 (Sa)	MAK-list 2005
1,8-Naphthylidene anhydride	81-84-5 (Sh)	MAK-list 2005
Natural rubber latex, Latex proteins	9006-04-6 (Sah)	MAK-list 2005 TRGS 540, encl.2 and 4
Neopentyl glycol diacrylate	(Sh)	AVE 2005
Nickel compounds, water-soluble	(Sh)	TRGS 540, encl 4, MAK-list 2005
- Nickel metallic	7440-02-0 (Sh)	MAK-list 2005
- Nickel acetate and similar soluble salts	373-02-4 (Sh)	MAK-list 2005
- Nickel carbonate	3333-67-3 (Sh)	MAK-list 2005
- Nickel dichloride	7718-54-9 (Sh)	MAK-list 2005
- Nickel monoxide	1313-99-1	MAK-list 2005
- Nickel dioxide	12035-36-8	MAK-list 2005
- Nickel nitrate	(Ss)	strong sensitizer
- Di-nickel trioxide	1314-06-3 (Sh)	MAK-list 2005
- Nickel hydroxide	12054-48-7 (Sh)	MAK-list 2005
- Nickel sulfide	16812-54-7	MAK-list 2005
- Nickel subsulfide	12035-72-2	MAK-list 2005
- Nickel sulfate	7786-81-4 (Sah)	MAK-list 2005
Nickel alloy	(Sah)	MAK-list 2005
4-Nitro-4'-aminodiphenylamine-2-sulfonic acid	91-29-2 (Sh)	MAK-list 2005
p-Nitrobenzyl bromide	100-11-8 (Sh)	BgVV 2001
p-Nitro-omega-bromacetophenon	99-81-0 (Ss)	BgVV 2001
4-(2-Nitrobutyl)-morpholine (70 weight %) and 4,4-(2-Ethyl-2-nitro-trimethylene) dimorpholine (20 weight %)	2224-44-4 (Ss) 1854-23-5 (Sh)	MAK-list 2005 MAK-list 2005

Allergens	CAS-Nr.	Remarks
p-Nitro cumene (1-Nitro-4-propan-2-yl-benzene)	1817-47-6 (Sh)	MAK-list 2005
2-Nitro-p-phenylene-diamine (N,N-Dihydroxy-3,6-diimino-cyclohexa-1,4-dien-1-amine)	5307-14-2 (Sh)	TRGS 907 and MAK-list 2005
p-Nitroso-N,N-dimethyl aniline	138-89-6 (Sh)	BgVV 2001
Oakmoss extract (<i>Evernia Prunastri</i>)	90028-68-5 (Ss)	Directive 2003/15/EC and MAK-list 2005
2-n-Octyl-4-isothiazolin-3-one	26530-20-1 (Sh)	MAK-list 2005 and BgVV 2001
Oil of Laurel (see Laurel oil)	8002-41-3 (Sh)	BgVV 2001
Oil of turpentine (see Turpentine)	8006-64-2 (Sh)	TRGS 907 and MAK-list 2005
Olaquintox (N-(2-Hydroxyethyl)-3-methyl-2-chinoxalincarboxamide-1,4-dioxid)	23696-28-8 (SP)	TRGS 907, MAK-list 2005 and BgVV 2001
Oxazolidine-E (5-Ethyl-3,7-dioxo-1-azabicyclo [3.3.0]octane)	7747-35-5 (Sh)	MAK-list 2005
Oxazolone (4-(Ethoxymethylidene)-2-phenyl-1,3-oxazol-5-one)	15646-46-5 (Ss)	AVE 2005 and extreme strong sensitizer
Oxirane (2-[(4-tert-butylphenoxy)methyl]oxirane)	3101-60-8 (Sh)	AVE 2005
Palladium(II)chloride and bio-available Palladium(II) compounds	7647-10-1 (Sh)	MAK-list 2005
Papain	9001-73-4 (Sa)	MAK-list 2005
Parthenolide	20554-84-1 (Ss)	BgVV 2001
Pentaerythritol triacrylate	3524-68-3 (Sh)	MAK-list 2005
3-n-Pentadecylcatechol (<i>Rhus toxicodendron L.</i>)	492-89-7	AVE 2005 and obligate sensitizer
Persulfate	(Sh)	TRGS 540, encl. 4
Peruvian balsam	8007-00-9 (Sh)	BgVV 2001
Phenol formaldehyde resins (Novolak, Resol)	9003-35-4 (Sh)	TRGS 907
p-Phenylenediamine	106-50-3 (Sh)	TRGS 540, encl. 4
o-Phenylenediamine	95-54-5 (Sh)	MAK-list 2005
Phenyl glycidyl ether (2-(Phenoxymethyl)oxirane)	122-60-1 (Sh)	BgVV 2001 and MAK-list 2005
Phenylhydrazine	100-63-0 (Sh)	BgVV 2001 and MAK-list 2005
Phenyl isocyanate	103-71-9 (Sah)	MAK-list 2005
N-Phenyl-1-naphthylamine	90-30-2 (Sh)	MAK-list 2005
N-Phenyl-2-naphthylamine	135-88-6 (Ss)	AVE 2005
Phthalic acid anhydride	85-44-9 (Sa)	MAK-list 2005
Pinene		
- α -Pinene (2,7,7-trimethylbicyclo[3.1.1]hept-2-ene)	80-56-6	AGOEF 2004 and BgVV 2001
- β -Pinene (6,6-dimethyl-2-methylidene-norpinane)	18172-67-3	AGOEF 2004 and BgVV 2001
Piperazine	110-85-0 (Sah)	MAK-list 2005
Platinum (Chloroplatinate)	(Sah)	MAK-list 2005, TRGS 540, encl. 2, TRGS 907 and obligate sensitizer
Polyethyleneglycol dimethacrylate	25852-47-5 (Sh)	AVE 2005

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Allergens	CAS-Nr.	Remarks
„Polymeric MDI“	901687-9 (Sah)	MAK-list 2005
Potassium chloroplatinate	(Sah)	TRGS 540, encl. 2, TRGS 907 and obligate sensitizer
Potassium dichromate (Chromium complexes, water soluble)	7778-50-9 (Sh)	TRGS 540, encl. 4 and BgVV 2001
Potassium dicyanoaurate	13967-50-5 (Sh)	AVE 2005
Primin (2-Methoxy-6-pentyl-cyclohexa-2,5-diene-1,4-dione)	15121-94-5 (Sh)	BgVV 2001, obligate sensitizer
Propiolactone (Oxetan-2-one)	57-57-8 (Sh)	AVE 2005
Propolis (Propolis cera)	85665-41-4 (Sh)	AVE 2005
3-Propylidene naphthalide	17369-59-4 (Sh) 100884-13-7	BgVV 2001
Pyrethrum	8003-34-7 (Sh)	MAK-list 2005
- Pyrethrin	121-21-1	AGOEF 2004
- S-bioallethrin	28434-00-6	AVE 2005
Pyromellitic dianhydride	89-32-7 (Sa)	TRGS 540, encl. 2
Quarternium 15 (1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride)	4080-31-3 (Sh)	BgVV 2001
Resorcinol	108-46-3 (Sh)	MAK-list 2005
Rubber ingredients	(Sh)	AVE 2005
- Dithiocarbamates	(Sh)	MAK-list 2005
- p-Phenylendiamine compounds	(Sh)	MAK-list 2005
- Thiazolderivatives	(Sh)	MAK-list 2005
- Thiurames	(Sh)	MAK list 2005
Salicyl alcohol (2-Hydroxybenzyl alcohol)	90-01-7 (Sh)	AVE 2005
Salicyl aldehyde (2-Hydroxybenzaldehyde)	90-2-8 (Sh)	AVE 2005
Salicylanilides, halogenated	(SP)	AVE 2005
Sesquiterpenlactone	(Sh)	TRGS 907 and MAK-list 2005
Sodium diethyldithiocarbamate	148-18-5 (Sh)	MAK-list 2005
Sodium-N-methyl dithiocarbamate (Metam sodium)	137-42-8 (Ss)	AVE 2005
Sodium thiosulfatoaurate	(Sh)	AVE 2005
Soybean ingredients	(Sa)	MAK-list 2005
Squaric acid diethyl ester	5231-87-8	BgVV 2001, obligate sensitizer
Squaric acid di-n-butyl ester (2,3-dibutoxycyclobut-2-ene-1,4-dione)	2892-62-8 (Sh)	BgVV 2001
Streptomycine A	82958-69-8 (Sh)	AVE 2005
Subtilisine	9014-01-1 (Sa)	MAK-list 2005
α -Terpinene	99-86-5 (Sah)	AGOEF 2004
Tetrachlorophthalic anhydride	117-08-8 (Sh)	TRGS 540, encl. 2
3,3',4',5'-Tetrachlorosalicylanilide	1154-59-2 (Sh)	BgVV 2001
Tetraethylthiurame disulfide (TETD, Disulfiram)	97-77-8 (Sh)	TRGS 540, encl. 4
Tetrahydrofurfuryl methacrylate	2455-24-5 (Sh)	MAK-list 2005
Tetramethylthiuram disulfide (TMTD) 1-((Dimethylthiocarbamoyldisulfanyl)-N,N-dimethylmethanethioamide	137-26-8 (Sah)	TRGS 540, encl. 4 and MAK-list 2005

Allergens	CAS-Nr.	Remarks
Tetramethylthiurame-monosulfide (TMTM)	97-74-5 (Sah)	TRGS 540, encl. 4 and BgVV 2001
3-Thioglycerol (3-Sulfanylpropane-1,2-diol)	96-27-5	BgVV 2001
Thioglycolacidamide (2-Sulfanylethanamide)	758-08-7	BgVV 2001
Thioglycolacidmethylen-glycolester (2-Hydroxyethyl 2-sulfanylacetate)	7380-58-7 (Sh)	BgVV 2001
Thiomersal (Merthiolate)	54-64-8 (Sh)	MAK-list 2005
Thiourea (Sulfanyl-methanimidamide)	62-56-6 (Sh, SP)	MAK-list 2005
Thiurame		TRGS 540, encl. 4
p-Toluidine (4-Methylaniline)	106-49-0 (Sh)	MAK-list 2005
Toluylendiamine (p-Toluylendiamine) and salts		TRGS 540, encl. 4 and BgVV 2001
Toluene-2,4-diamine	95-80-7 (Sh)	MAK-list 2005
Toluene-2,5-diamine	95-70-5 (Sh)	MAK-list 2005
Toluenediisocyanate (Diisocyanatoluole):	(Sa)	MAK-list 2005
- Toluene-2,4-diisocyanate	584-84-9	MAK-list 2005
- Toluene-2,6-diisocyanate	91-08-7	MAK-list 2005
Treemossa extract (<i>Evernia furfuracea</i> extract)	90028-67-5 (Ss)	Directive 2003/15/EC
Triethanolamine	102-71-6 (Sh)	MAK-list 2005
- Atranol	(Sh)	AVE 2005
- Chloratranol	(Sh)	AVE 2005
Tribromo salicylanilide	(Sh)	AVE 2005
Triethylene glycol diacrylate	1680-21-3 (Sh)	MAK-list 2005
Triethylene glycol dimethacrylate	109-16-0 (Sh)	MAK-list 2005
Triethylenetetramine	112-24-3 (Sh)	MAK-list 2005
Triisobutyl phosphate	126-71-6 (Sh)	MAK-list 2005
Trimellitic anhydride	552-30-7 (Sa)	TRGS 540, encl. 2 and MAK-list 2005
Trimethylolpropane triacrylate	15625-89-5 (Sh)	MAK-list 2005
2,4,6-Trinitrochlorobenzene (Picryl chloride)	88-88-0	MAK-list 2005
2,4,6-Trinitrophenol	88-89-1 (Sh)	MAK-list 2005
Tripropylene glycol diacrylate	42978-66-5 (Sh)	MAK-list 2005
Tulipaline A (α -Methylene- γ -butyrolacton)	547-65-9 (Sh)	TRGS 907 and BgVV 2001
Tuliposide A (3-Methylideneoxolan-2-one)	547-65-9 (Ss)	TRGS 907 and BgVV 2001
Turpentine	8006-64-2 (Sh)	TRGS 907 and BgVV 2001
Urushiol	53237-59-5 a. o.	BgVV 2001
Vinyl carbazole	1484-13-5 (Sh)	MAK-list 2005
Vanillin (4-Hydroxy-3-methoxy-benzaldehyde)	121-33-5	AGOEF 2004
Wood, wood powder (listed in German)		TRGS 907
Woods:		MAK-list 2005
- <i>Acacia melanoxylon</i> R.Br., tropische Akazie (engl. Blackwood)	(Sh)	
- <i>Brya ebenus</i> DC., Cocusholz, Ebony coccus-wood	(Sh)	

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Allergens	CAS-Nr.	Remarks
- <i>Chlorophora excelsa</i> (Welw.) Benth. & Hook, Iroko, Kambala	(Sh)	
- <i>Dalbergia latifolia</i> Roxb., Indian rosewood, Bombay blackwood	(Sh)	
- <i>Dalbergia melanoxylon</i> Guill. et Perr., African Blackwood	(Sh)	
- <i>Dalbergia nigra</i> Allem., Brazilian rosewood	(Sh)	
- <i>Dalbergia retusa</i> Hemsl., engl.: Cocobolo	(Sh)	
- <i>Dalbergia stevensonii</i> Stanley, Honduras rosewood	(Sh)	
- <i>Distemonanthus benthamianus</i> Baill., Ayan, an-yaran	(Sh)	
- <i>Grevillea robusta</i> A.Cunn., Silky oak	(Sh)	
- <i>Khaya anthoteca</i> C.DC., African Mahogany	(Sh)	
- <i>Machaerium scleroxylon</i> Tul., Santos Palisander, morado	(Sh)	

Allergens	CAS-Nr.	Remarks
- <i>Mansonia altissima</i> A.Chev., Bété, Mansonia	(Sh)	
- <i>Paratecoma peroba</i> (Record) Kuhl., Peroba do campo.: White Peroba	(Sh)	
- <i>Tectona grandis</i> LL., Teak	(Sh)	
- <i>Terminalia superba</i> Engl. u. Diels, Limba, Afara, Fraké	(Sa)	
- <i>Thuja plicata</i> (D. Don.) Western Red Cedar	(Sah)	
- <i>Triplochiton scleroxylon</i> K.Schum., Abachi, Wawa	(Sah)	
Xylanase	37278-89-0 (Sa)	MAK-list 2005
m-Xylylenediamine ([3-(Aminomethyl)phenyl]methanamine)	1477-55-0 (Sh)	TRGS 540, encl. 4 and MAK-list 2005
Zinc chromate	13530-65-9 (Sh)	MAK-list 2005
Zinc dibutyl dithiocarbamate	136-23-2 (Sh)	BgVV 2001
Zinc diethyl dithiocarbamate	14324-55-1	BgVV 2001
Zirconium and its unsoluble salts	7440-67-7 (Sah)	MAK-list 2005
Zirconium compounds (soluble)	(Sah)	MAK-list 2005

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Appendix (in German):

zu 1

Allergene in **TRGS 540 Sensibilisierende Stoffe** von 12.97

Anlage 2: Stoffe, die besonders häufig und/oder besonders schnell an den Atemwegen zu Sensibilisierungen und allergischen Erkrankungen führen
Anlage 4: Stoffe mit erhöhtem Risiko für die Entstehung eines allergischen Kontaktekzems

Allergene in **TRGS 907 Verzeichnis sensibilisierender Stoffe** von 12.97

H = hautresorptiv

R-Sätze

R-42 Sensibilisierung durch Einatmen möglich

R-43 Sensibilisierung durch Hautkontakt möglich

zu 2

Directive 2003/15/EC of the European Parliament and of the Council of 27 February 2003 amending Council Directive 76/768/EEC on the approximation of the laws of the Member States relating to **cosmetic products**

Literatur

1. *van Moerbeke D* (ed.): European allergy white paper. UCB Institute Allergy (Brussels 1999)
2. *Ring J, Fuchs T, Schultze-Werninghaus G* (eds.): Weißbuch. Allergie in Deutschland. 2. Auflage, Urban & Vogel (München 2004)
3. NIH (National Institutes of Health): The murine local lymph node assay: A test method for assessing the allergic contact dermatitis potential of chemical compounds. NIH Publication. No. 99 – 4494 (1999)
4. *Basketter DA, Clapp C, Jefferies D, Safford B, Ryan CA, Gerberick F, Dearman RJ, Kimber I:* Predictive identification of human skin sensitization thresholds. *Contact Dermatitis* **53** 5 (2005) 260-7
5. *Diel F, Detscher M, Schock B, Ennis M:* In vitro effects of the pyrethroid S-bioallethrin on lymphocytes and basophils from atopic and nonatopic subjects. *Allergy* **53** 11 (1998) 1052-9
6. *Diel F, Horr B, Borck H, Savtchenko H, Mitsche T, Diel E:* Pyrethroids and PBO affect human T-lymphocytes in vitro. *Tox Letters* **107** 1-3 (1999) 65-74
7. Deutsche Forschungsgemeinschaft (DFG): MAK- und BAT-Werte-Liste - Maximale Arbeitsplatzkonzentrationen und Biologische Arbeitsstofftoleranzwerte. Wiley VCH, Mitteilung 41 (Weinheim 2005)
8. Arbeitsgemeinschaft ökologischer Forschungsinstitute e.V. (AGOEF): Orientierungswerte für Inhaltsstoffe von Raumluft und Hausstaub. *UMWELT & GESUNDHEIT* **15** 1 (2004) 6-13
9. *Diel F, Schubert H, Fischer M, Schütz T, Weber KM, Gagelmann M, Boonen H, Steneberg A, Axt-Gadermann M, Khanferyan R, Diel E:* Criteria for allergenic building materials. *UMWELT & GESUNDHEIT* **14** 1 (2003) 6-12
10. *Kayser D, Schlede E* (Hrsg.): Chemikalien und Kontaktallergie – Eine bewertende Zusammenstellung. Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin BgVV, Urban & Vogel (München 2001)