Sub-Chapter IV

ETHERS, ALCOHOL PEROXIDES, ETHER PEROXIDES, KETONE PEROXIDES, EPOXIDES WITH A THREE-MEMBERED RING, ACETALS AND HEMIACETALS, AND THEIR HALOGENATED, SULPHONATED, NITRATED OR NITROSATED DERIVATIVES

29.09 - Ethers, ether-alcohols, ether-phenols, ether-alcohol-phenols, alcohol peroxides, ether peroxides, ketone peroxides (whether or not chemically defined), and their halogenated, sulphonated, nitrated or nitrosated derivatives.

- Acyclic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives :

2909.11 - -Diethyl ether

2909.19 - - Other

2909.20 - Cyclanic, cyclenic or cycloterpenic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives

2909.30 - Aromatic ethers and their halogenated, sulphonated, nitrated or nitrosated derivatives

- Ether-alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives :

2909.41 - - 2,2'-Oxydiethanol (diethylene glycol, digol)

2909.43 - - Monobutyl ethers of ethylene glycol or of diethylene glycol

2909.44 - - Other monoalkylethers of ethylene glycol or of diethylene glycol

2909.49 - - Other

2909.50 - Ether-phenols, ether-alcohol-phenols and their halogenated, sulphonated, nitrated or nitrosated derivatives

2909.60 - Alcohol peroxides, ether peroxides, ketone peroxides and their halogenated, sulphonated, nitrated or nitrosated derivatives

(A) **ETHERS**

Ethers may be considered as alcohols or phenols in which the hydrogen atom of the hydroxyl group is replaced by a hydrocarbon radical (alkyl or aryl). They have the general formula : ($R-O-R^1$), where R and R^1 may be the same or different.

These ethers are very stable, neutral substances.

If the radicals belong to the acyclic series, the ether is also acyclic; cyclic radicals give cyclic ethers.

The first ether in the acyclic series is gaseous, but others are volatile liquids with a characteristic odour of ether; the higher members are liquids or sometimes solids.

29.09

(I) **Symmetrical acyclic ethers**.

(1) **Diethyl ether** ($C_2H_5OC_2H_5$). Colourless, refractive liquid, with a characteristic burning odour; extremely volatile and very inflammable. Used as an anaesthetic and in organic synthesis.

(2) **Di(chloroethyl) ether, or dichlorodiethyl ether**.

(3) **Di-isopropyl ether**.

(4) **Dibutyl ether**.

(5) **Dipentyl ether** (diamyl ether).

(II) **Non symmetrical acyclic ethers**.

(1) **Ethyl methyl ether**.

(2) **Ethyl isopropyl ether**.

(3) **Butyl ethyl ethers**.

(4) **Pentyl ethyl ethers**.

(III) **Cyclanic, cyclenic or cycloterpenic ethers**.

(IV) **Aromatic ethers**.

(1) **Anisole** ($C_6H_5OCH_3$) (methyl phenyl ether). Colourless liquid with a pleasant odour; used in organic synthesis (e.g., synthetic perfumes) and also as a solvent and vermifuge (anthelmintic).

(2) **Phenetole** (ethyl phenyl ether) ($C_6H_5OC_2H_5$).

(3) **Diphenyl ether** ($C_6H_5OC_6H_5$). Colourless crystalline needles with an odour like that of geraniums; used in perfumery.

(4) **1,2-Diphenoxyethane** (ethylene glycol diphenyl ether).

(5) **Anethole**, contained in aniseed oil. Small crystals at a temperature below 20 ºC; at a higher temperature, it is a mobile liquid with a strong odour of aniseed oil.

(6) **Dibenzyl ether**.

(7) **Nitrophenetoles**, nitrated derivatives of phenetole. *o*-Nitrophenetole is a yellow oil. *p*-Nitrophenetole is crystalline.

(8) **Nitroanisoles**, nitrated derivatives of anisole. *o*-Nitroanisole is liquid. *m*- and *p*-Nitroanisoles are lamelliform crystals. Trinitroanisole is a very violent explosive.

(9) **2-tert-Butyl-5-methyl-4,6-dinitroanisole** (musk ambrette), yellowish crystals combining the perfumes of ambrette oil and natural musk.

(10) *β*-**Naphthyl methyl and ethyl ethers** (artificial neroli oil). Colourless crystalline powders with an odour similar to that of orange-flower oil.

(11) **Methyl ethers of *m*-cresol and butyl-*m*-cresols**.

(12) **Phenyl tolyl ether**.

(13) **Ditolyl ether**.

(14) **Benzyl ethyl ether**.

(B) ETHER-ALCOHOLS

These are derived from polyhydric alcohols or phenol-alcohols by replacing the hydrogen of the phenolic hydroxyl group (in the case of phenol-alcohols), or of one of the alcoholic hydroxyl groups (in the case of polyhydric alcohols), by an alkyl or aryl radical.

(1) **2,2'-Oxydiethanol** (diethylene glycol, digol). Colourless liquid; used in organic synthesis, as a solvent for gums and resins, for the preparation of explosives and plastic materials.

(2) **Monomethyl, monoethyl, monobutyl and other monoalkylethers of ethylene glycol or diethylene glycol**.

(3) **Monophenyl ethers of ethylene glycol or of diethylene glycol**.

(4) **Anisyl alcohol**.

(5) **Guaietolin** (INN) (glycerol mono (2-ethoxyphenyl)ether); **guaifenesin** (INN) (glycerol mono(2-methoxyphenyl)ether).

(C) ETHER-PHENOLS AND ETHER-ALCOHOL-PHENOLS

These are derived from dihydric phenols or phenol alcohols by replacing the hydrogen of the alcohol hydroxyl group (in the case of phenol alcohols), or of one of the phenol hydroxyl groups (in the case of dihydric phenols), by an alkyl or aryl radical.

(1) **Guaiacol**, found in beech-wood tar. The main component of wood creosote. Colourless crystals with a characteristic aromatic odour; but once melted, guaiacol remains liquid. Used in medicine and in organic synthesis.

(2) **Sulfogaiacol** (INN) (potassium guaiacolsulphonate), a fine powder, extensively used in medicine.

(3) **Eugenol**, obtained from cloves, a colourless liquid with an odour of carnations.

(4) **Isoeugenol**, obtained synthetically from eugenol. A component of nutmeg oil.

(5) **Pyrocatechol monoethyl ether** (guaethol), found in Swedish pine-wood oil. Caustic, colourless crystals with an aromatic odour.

(D) **ALCOHOL PEROXIDES, ETHER PEROXIDES AND KETONE PEROXIDES**

These are compounds of the ROOH, $ROOR^1$ and $ROOR^2OOR^1$ series, in which R, R^1 and R^2 are organic radicals and R and R^1 may be the same or different.

Examples are **ethyl hydroperoxide**, **diethyl peroxide** and **1,1-di(tert-butylperoxy)cyclohexane**.*

This heading also includes **ketone peroxides** (whether or not chemically defined), e.g., cyclohexanone peroxide (1-hydroperoxycyclohexyl 1-hydroxycyclohexyl peroxide).

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This heading also covers the halogenated, sulphonated, nitrated or nitrosated derivatives of ethers, ether-alcohols, ether-phenols, ether-alcohol-phenols, alcohol peroxides, ether peroxides or ketone peroxides, and compound derivatives (for example, nitrosulphonated, sulphohalogenated, nitrohalogenated and nitrosulphohalogenated derivatives).