

Vinylbenzene and divinylbenzene

Definition of causal agent

Vinylbenzene (styrene) is a colourless to yellow, oily liquid with a boiling point of 145°C with a sweet, floral odour at low concentrations and sharp penetrating, disagreeable odour at high levels. Divinylbenzene (vinylstyrene) exists as a mixture of its ortho-, meta- and para-isomers. It is a clear, slightly amber, strongly aromatic smelling liquid with a boiling point of 195°C.

Main occupational uses and sources of exposure:

Occupational exposure to vinylbenzene occurs during synthesis and manufacture of polymers (polystyrene), copolymers (styrene-butadiene latex preparations, acrylonitrile-butadiene-styrene resins) and unsaturated polyester resins. It is also used as a solvent and as an additive in aircraft fuel.

Divinylbenzene is used in the synthesis and manufacture of resins, plastics, composites and latexes, too. It is used as a monomer in the manufacture of insecticides and as an ion-exchange resin in water purification and in dentistry.

The exposure route for both substances is by inhalation; divinylbenzene is also absorbed following skin contact.

Toxic effects

1. Local effects

Irritant effects

Vinylbenzene and divinylbenzene cause irritation to the skin and mucous membranes (See section on '**Occupationally caused irritation of the skin and mucous membranes**' in Annex I entry nr. 202).

2.6 g/m³ (600 ppm): intense irritation

3.4 g/m³ (800 ppm): immediate acute symptoms

Guide value (vinylbenzene):

0,43 – 1,3 g/m³ (100 - 300 ppm): irritation of eyes, nose, and upper respiratory tract

2. Systemic effects

Acute

Narcotic syndrome

Headache, lassitude, dizziness, nausea, drowsiness, weakness, unsteady gait, confusion, loss of consciousness and possibly coma.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed, by:

- History and study of working conditions providing evidence of intense exposure (taking account of the possibility of cutaneous absorption);
- and if available:
 - Biological monitoring
Vinylbenzene in the blood
Vinylbenzene: mandelic and phenylglyoxylic acid in the urine,
 - Workplace air monitoring (vinylbenzene):

Guide value:

Atmospheric concentration well above 426 mg/m³ (100 ppm)

300 - 800 ppm: central nervous system depression

5000 ppm: immediately dangerous to life

Minimum duration of exposure: From a few minutes to a few hours, depending on intensity of exposure

Maximum latent period: 24 hours

3. Chronic effects

Chronic toxic encephalopathy (See Annex I entry nr. 135 on ***Encephalopathies due to organic solvents which do not come under other headings***).

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed, by:

History and study of working conditions providing evidence of prolonged or repeated exposure (taking account of the possibility of cutaneous absorption);

Biological monitoring

Vinylbenzene: Mandelic and phenylglyoxylic acid in the urine (> 600 mg/g creatinine),

Workplace air monitoring (vinylbenzene):

Guide value: atmospheric concentration: well above 86 mg/m³ (20 ppm)

Minimum duration of exposure: See Annex I entry nr. 135 on ***Encephalopathies due to organic solvents which do not come under other headings***.

Maximum latent period: See Annex I entry nr. 135 on ***Encephalopathies due to organic solvents which do not come under other headings***.

Peripheral neuropathy and reversible impairment of colour discrimination (tritan type) have been described. There is some suggestion of an interaction between vinylbenzene, noise exposure and hearing loss. Hepatic function may be altered in some cases. Studies on carcinogenicity are inconclusive (possible occurrence of leukaemias and lymphatic tumours is debatable).