Safe. Strong.
Styrodur®

Chemical Resistance

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Chemical Resistance of Styrodur®

1. Resistance to Chemical Substances

The resistance of Styrodur® rigid foam boards to chemical substances compares to that of shaped elements made of polystyrene. In contrast to compact polystyrene, however, chemical damage has a slightly faster and stronger impact because the surface area is enlarged through foaming. On the other hand, the foam membrane of the Styrodur® boards exhibits greater resistance to a number of substances.

To avoid errors during application, it is therefore important to know how Styrodur® will behave towards substances used in practice (e.g. in civil engineering).

2. Testing

The resistance test is carried out on the basis of DIN 53428 "Determination of the behaviour of cellular plastics when exposed to fluids, vapours, and solids". According to this standard, five rigid foam cubes with an edge length of 50 mm are submerged in the test fluid at a temperature of 20°C and the weight increase is measured 28 days later.

The test can be simplified by placing foam specimens measuring 100 x 50 mm x board thickness in the test fluid for up to four weeks and determining the change in length as a percentage. If the test can be performed at approximately 50°C, the duration of the test can be considerably shortened.

In case the effect of the test fluid on the foam membrane is to be established, it is recommended that a weighted glass tube with an inner diameter of 113 mm and a height of 75 mm is placed onto board sections measuring 200 x 200 mm and the test fluid is filled in the glass tube. For low-viscosity agents, the glass tube on the board must be sealed on the outside. The contact surface area is 100 cm^2. The test measures the change in the fluid level in the glass as well as the change in volume of the specimen. The latter is most effectively determined by means of submersion in water. If sufficiently large immersion containers are unavailable, the test may also be performed with smaller specimens, which should not be smaller than 125 x 125 mm. To ensure a contact surface area of 50 cm^2, which is still suitable for the evaluation and calculations, the inner diameter of the glass tube should be 80 mm.

The methods described here are sufficient to provide a basic understanding of the resistance of Styrodur® to chemical substances. However, field trials or tests under conditions simulating actual practice are essential to make sure that certain substances do not cause any changes at all, such as in the mechanical properties of the rigid foam, or only produce changes within tolerable limits. The same applies if the composition of a substance is unknown. For instance, coatings and adhesives may contain a solvent that is harmful to the rigid foam. In this case, testing is necessary to ensure that the Styrodur® boards will not be affected.

The following list provides information about the behaviour of Styrodur® rigid foam boards towards certain selected chemical substances.

Chemical Resistance

# of Styrodur®

3. Behaviour Towards Selected Substances

Substance	Resistance
1 Water/aqueous solutions	
Water	+
Seawater	+
Salt solutions	+
Hydrogen peroxide (3%)	+
2 Acids	
2.1 Diluted acids	
Hydrochloric acid	+
Nitric acid	+
Sulphuric acid	+
Phosphoric acid	+
Hydrofluoric acid	+
Formic acid	+
Acetic acid	+
2.2 Concentrated acids	
Hydrochloric acid	+
Nitric acid	+
Sulphuric acid	+
Phosphoric acid	+
Hydrofluoric acid	+
Acetic acid	–
2.3 Weak acids	
Humic acid	+
Carbonic acid (also dry ice)	+
Lactic acid	+
Tartaric acid	+
Citric acid	+
3 Bases	
Sodium hydroxide solution	+
Potassium hydroxide solution	+
Lime water	+
Ammonia water	+
Bleaching solutions (hypochlorite)	+
Soap solutions	+

Resistant	+
Not resistant	–
Case-by-case basis	#
Observe manufacturer's information	H

Substance	Resistance
4 Gases	
4.1 Inorganic gases	
Ammonia	–
Halogens (fluorine, chlorine, bromine)	–
Sulphur dioxide, sulphur trioxide	–
4.2 Organic gases	
Methane	+
Ethane, ethene	+
Propane, propene	+
Butane, butene, butadiene	–
Natural gas	+
4.3 Liquid inorganic gases	
Nitrogen, oxygen, hydrogen	+
Noble gases	+
Ammonia	+
Carbon dioxide, carbon monoxide	+
Sulphur dioxide	–
4.4 Liquid organic gases	
Propane, propene	–
Butane, butene, butadiene	–
Natural gas	+
5 Hydrocarbons	
5.1 Aliphatic hydrocarbons	
Hexane, cyclohexane	–
Heptane	–
Paraffin oil	–
5.2 Aromatic hydrocarbons	
Benzene, toluene, xylene	–
Ethyl benzene	–
Styrene	–
5.3 Halogenated hydrocarbons	–
5.4 Fuels	
Petrol (standard, premium)	–
Diesel fuel, heating oil	–
6 Alcohols	
Methanol, ethanol, propanol, butanol	+
Cyclohexanol	+
Glycols	+
Glycerin	+

Substance	Resistance
7 Solvents	
7.1 Ketones, ethers, esters	
Ketones (such as acetone, cyclohexanone)	–
Ethers (such as diethyl ether, dioxane, THF)	–
Esters (such as ethyl acetate, butyl acetate)	–
Dibutyl phthalate	–
Paint thinner	–
Mineral greases and oils	H
7.2 Amines, amides, nitriles	
Aniline	–
Diethylamine, triethylamine	–
Dimethyl formamide	–
Acetonitrile	–
Acrylonitrile	–
8 Building materials	
Cement	+
Gypsum	+
Lime	+
Anhydride	+
Tar	–
Bitumen	+
Cold bitumen and bituminous fillers	
- water-based	+
- solvent-based	–
Mortar and plaster systems	
- mineral-based	+
- resin-bonded	H
PUR assembly foam	+
Joint fillers	
- acrylic-based	H
- silicon-based	+
Adhesives	
- epoxy-based	+
- polyurethane-based	+
- bitumen-rubber-based	+
- solvent-based	–
Paints/coatings	
- dispersion paints	H
- water-based	H
- solvent-based	–
9 Material of biological origin	
Manure	+
Biowaste	+
Biogas	+
Vegetable/animal fats and oils	#

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