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Properties

Resistance to chemicals of expanded materials

Styropor foam's resistance to chemicals corresponds to that of parts made from polystyrene. However, because Styropor's cell structure gives the material a greater surface area, damage occurs quicker, and to a greater extent, than is the case with the compact basic polystyrene material. Similarly, low density Styropor is attacked far more easily than higher density Styropor.

In practice (eg, in the construction or packaging sectors) it is very important to know how Styropor reacts to chemical substances in order to prevent defects.

Test

The test is based on DIN 53428 "Testing of cellular materials; Determination of the resistance to liquids, vapours, gases and solid materials". In this DIN standard, 5 foam cubes (skinless) of side 5 cm are immersed in the test medium for a definite length of time and changes to mass and size measured. The immersion time depends on the test medium: for liquids it is 72 hours; for gases 24 hours; and for liquefied gases, at least three hours.

For liquefied gases the immersion temperature is at, or just under, the boiling point of the test medium; in other media, immersion takes place at room temperature.

For visual assessment of damage, DIN 53428 suggests a scale of criteria from 0 (no change) to 5 (severely damaged). To give a simpler overview, the table overleaf contains the following assessment criteria:

\+ = unchanged (≙ 0)
= resistant
+– = slight change (≙ 2)
= limited resistance
(small change in size)
– = severely damaged (≙ 5)
= not resistant

If Styropor foam comes into contact with unknown substances that could contain damaging solvents (eg, paint or adhesive) one can start by making sure the foam is not attacked by carrying out a trial under practical conditions. The trial may be shortened considerably if it is carried out at temperatures above 20 °C (eg, 50 °C). To get clearer evidence of the foam's resistance, the severity of the test conditions can be increased by testing a foam whose density is much lower than that intended for the actual application.

The table overleaf shows the resistance of Styropor foam to the most common chemical substances.

Substance	Styropor P & F foams
Sea water	+
Water	+
Alkalis:	
Ammonia water	+
Bleaching agents (hypochlorite, hydrogen peroxide)	+
Caustic soda solution	+
Lime water	+
Potassium hydroxide solution	+
Soap solutions	+
Diluted acids:	
Acetic acid, 50 %	+
Formic acid, 50 %	+
Hydrochloric acid, 18 %	+
Hydrochloric acid, 7 %	+
Hydrofluoric acid, 4 %	+
Hydrofluoric acid, 40 %	+
Nitric acid, 13 %	+
Nitric acid, 50 %	+
Phosphoric acid, 50 %	+
Phosphoric acid, 7 %	+
Sulfuric acid, 10 %	+
Sulfuric acid, 50 %	+
Concentrated acids:	
Acetic acid, 96 %	–
Formic acid, 99 %	+
Hydrochloric acid, 36 %	+
Nitric acid, 65 %	+
Propanoic acid, 99 %	–
Sulfuric acid, 98 %	+
Fuming acids:	
Nitric acid	–
Sulfuric acid	–
Anhydrides:	
Carbon dioxide, solid	+
Ethanoic anhydride (acetic anhydride)	–
Sulfur trioxide	–
Weak acids:	
Carbonic acid	+
Citric acid	+
Humic acid	+
Lactic acid	+
Tartaric acid	+
Gases:	
a) inorganic	
Ammonia	–
Bromine	–
Chlorine	–
Sulfur dioxide	–
b) organic	
Butadiene	–
Butane	–
Butene	–
Ethane	+
Ethene (ethylene)	+
Ethyne (acetylene)	+
Methane	+
Natural gas	+
Propane	+
Propene (propylene)	+
Propene oxide	–

Substance	Styropor P & F foams
Liquefied gases:	
a) inorganic	
Ammonia	+
Hydrogen	+
Inert gases	+
Nitrogen	+
Oxygen (risk of explosion)	+
Sulfur dioxide	–
b) organic	
Butadiene	–
Butane	–
Butene	–
Ethane	+
Ethene	–
Ethene oxide	–
Ethyne (acetylene)	–
Methane	+
Natural gas	+
Propane	–
Propene	–
Propene oxide	–
Aliphatic hydrocarbons:	
Cyclohexane	–
Diesel fuel, Heating oil	–
Gasoline (regular & super grade)	–
Heptane	–
Hexane	–
Paraffin oil	+–
Vaseline	+
White spirit 155 – 185 °C	–
White spirit 55 – 95 °C	–
Alcohols:	
Butanol	+–
Coconut oil alcohol	+
Cyclohexanol	+
Diethylene glycol	+
Ethanol	+–
Ethylene glycol	+
Glycerin	+
Iso-propanol	+
Methanol	+–
Amines:	
Aniline	–
Diethyl amine	–
Ethyl amine	+
Triethyl amine	–
Miscellaneous organic substances:	
Acetone	–
Acetone nitrile	–
Acrylonitrile	–
Dimethylformamide	–
Esters	–
Ethers	–
Halogenated hydrocarbons	–
Ketones	–
Olive oil	+
Paint thinners	–
Tetrahydrafuran	–

Substance	Styropor P & F foams
Inorganic building materials:	
Anhydrite	+
Cement	+
Chalk	+
Gypsum	+
Sand	+
Organic building materials:	
Bitumen	+
Cold asphalt and solvent-based bituminous cement (free from aromatics)	–
Cold asphalt and water-based bituminous cement	+
Aromatics:	
Benzene	–
Cumol	–
Ethyl benzene	–
Phenol, aqu. soln. 1 %	+
Phenol, aqu. soln. 33 %	–
Styrene	–
Toluene	–
Xylene	–
Vapours of:	
Camphor	–
Naphthalene	–

Styropor FH can be used to produce foams that have increased resistance to aromatic-free hydrocarbons compared with other Styropor grades. The suitability of this product for a particular application must be tested in each individual case.

Note

The information submitted in this publication is based on our current knowledge and experience. In view of the many factors that may affect processing and application, these data do not relieve processors of the responsibility of carrying out their own tests and experiments; neither do they imply any legally binding assurance of certain properties or of suitability for a specific purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed.

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