

Technirez® 150

Technical Data Sheet.

Typical data

Phosphorus content:	% (w/w)	25.4
Molecular weight	g/mol	122.1
pH value (10 % in water)		approx. 1.7
Melting point:	°C	approx. 16 - 18
Viscosity	cps	100-300

1 Description

Technirez 150 is a reactive, halogen free flame retardant with a high phosphorus content. The product is soluble in commonly used solvents as water, DMF, DMSO, MEK, methoxypropanol and acetone.

Epoxy laminates with Technirez 150 were successfully tested under IPC 4101. Technirez 150 can be used as a reactive flame retardant which is used for a modification of epoxy novolac resins in a pre-reaction step but can also be used as it is in the final curing step in combination with other hardeners (i.e. phenolic hardeners). In addition to its application as flame retardant (FR) in epoxy laminates for E & E applications it can be used for infiltration processes due to the liquid character and will not block the mold with the glass or carbon fabric / cloth.

Compared to other reactive flame retardants Technirez 150 has a much higher phosphorus content and therefore smaller dosages are sufficient to achieve the required flammability. Compared to DOPO (Dihydroxaphosphaphenanthreneoxide) chemistry about half of the amount of Technirez EP 150 is needed to obtain UL 94 V-0 test results. Especially in combination with the synergists melamine polyphosphate (MPP) and melamine cyanurate (MC) the performance can be drastically increased.

2 Uses

2.1 Technirez 150 as reactive flame retardant for epoxy resin modification

If it is used for the modification of epoxy resins, 15 parts of Technirez 150 are sufficient, resulting in a phosphorus content of 3,8 % in the resin (table 1). If it is used in combination with MC or MPP the Technirez EP 150 content can be further reduced and 8 parts of FR in combination with 92 parts of epoxy resin are sufficient to obtain a UL 94, V-0 (1,5 mm) in the final hardened product (phenolic cure).

Product	parts	Reactive equivalent	% P
EPN resin	85	180 g/mol	0
Technirez® 150	15	122 g/mol	25.4
Resulting P-modified EPN-resin	100	286	3.8

Table 1: Example for epoxy novolac (EPN) resin modification with Technirez EP 150 resulting P-modified resin with 3.8 % Phosphorus content

Product	parts	Reactive equivalent	% P
EPN resin	92	180 g/mol	0
Technirez EP 150	8	122 g/mol	25,4
Resulting P-modified EPN-resin	100	225 g/mol	2,0

Table 2: Example for epoxy novolac (EPN) resin modification with Technirez EP 150 resulting P-modified resin with 2.0 % Phosphorus content

Product	parts	Reactive equivalent	% P
P-modified EPN-resin (3,8 % P)	100	286 g/mol	3.8
Phenolic-Hardener	36.7	105 g/mol	0
Cured product	136.7	0	2.8

Table 3: Guiding formulation without synergist

Product	parts	Reactive equivalent	% P
P-modified EPN-resin (2,0 % P)	100	225 g/mol	2.0
Hardener	46.6	105 g/mol	0
Synergist (MC)	25.9	0	0
Cured product	172.5	0	1.2

Table 4: Guiding formulation with synergist

Epoxy novolac resins (EPN) should be used for this reaction. After heating of the epoxy resin to 110°C and a short vacuum removal of low boiling impurities the temperature of the resin is increased to 130°C. At this temperature the Technirez 150 is added and an exothermal process can be observed. The reaction mixture is heated for an additional 30 min to complete the reaction. For easier handling and to reduce viscosity of the final product it is of advantage to add some solvent (i.e. Dowanol PM) during the cooling process. About 15 w% are sufficient. Afterwards the epoxy equivalent of the modified resin can be controlled and the reaction with the hardener can be carried out in the normal manner.

2.2 Technirez® 150 in epoxy coating formulations

For this application the liquid Technirez 150 is added to the coating/varnish formulation where it reactively links to the epoxy resin during the curing process. It should be taken into account that Technirez 150 will react during this process with the epoxy functionalities on the resin and the hardener content should be adjusted (reduced). This reactive processing of Technirez 150 has the big advantage that in contrast to conventional additive flame retardants, migration processes can be excluded. Technirez EP 150 can be mixed with the phenolic hardener solutions before combining with the epoxy resin. Gel times and viscosities have to be adjusted as usual.

Product	parts	Reactive equivalent	% P
EPN-resin	85	180 g/mol	0
Technirez EP 150	15	122 g/mol	25.4
Phenolic-Hardener	36.7	105 g/mol	0
Cured product	136.7	0	2.8

Table 5: Technirez 150 as co-cure

3 Additional information

Storage:	Room temperature, closed container, 2 Years
Safety:	For further information, see corresponding SDS of Technirez 150
Packaging:	5 gal Pail, 55 Gal Drum, 250 Gal Tote

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