

## Technirez<sup>®</sup> 150

### Typical values\*

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

### 1 Description

Technirez<sup>®</sup> 150 is a reactive, low viscosity, 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<sup>®</sup> 150 were successfully tested under IPC 4101. The product 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<sup>®</sup> 150 has a much higher phosphorus content and therefore smaller levels are needed to achieve the required flammability. As compared to DOPO (Dihydrooxaphosphaphenanthreneoxide), a solid powder only less than half of the quantity of Technirez<sup>®</sup> 150 is needed to obtain UL 94 V-0 test results. In combination with the synergists like melamine polyphosphate (MPP) and melamine cyanurate (MC) the performance can be further increased.

### 2 Uses

#### 2.1 Technirez<sup>®</sup> 150 as reactive flame retardant for epoxy resin modification

If used for the modification of epoxy resins, 15 phr of Technirez<sup>®</sup> 150 is will result in a phosphorus content of 3.8 % in the resin (table 1). If it is used in combination with MC or MPP the Technirez<sup>®</sup> 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 <sup>®</sup> 150	15	122 g/mol	25.4
Resulting P-modified EPN-resin	100	286	3.8

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Table 1: Epoxy novolac (EPN) resin modification with Technirez® 150 resulting P-modified resin with 3.8 % Phosphorus content

Product	parts	Reactive equivalent	% P
EPN resin	92	180 g/mol	0
Technirez® 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® 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

When added to the coating/varnish formulation where it reactively links to the epoxy resin during the curing process, 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® 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® 150	15	122 g/mol	25,4
Phenolic-Hardener	36.7	105 g/mol	0
Cured product	136.7	0	2.8

## 3 Additional information

Storage: Room temperature, closed container, 6 months

Safety: For further information, see corresponding SDS of Technirez® 150

Specifications: Please contact ACCI for Specifications for Technirez® 150. Typical values should not be used as specifications.

Packaging: 18Kg Pail, 250kg Drum, 1000Kg tote

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