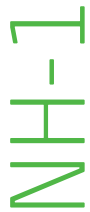


Emerald™
Innovation®



Great Lakes
SOLUTIONS
a Chemtura business

Great Lakes Solutions

Halogen-Free Flame Retardant for Flexible Polyurethane Foam



Global Leader In Flame Retardants

Innovative. Reliable. Sustainable.

For close to a century, we have helped our customers across the globe to meet their technical needs with a broad portfolio of products and solutions. We are proud of our history, and look forward to helping our customers meet future flammability performance, safety and compliance requirements by refining and redefining our portfolio with new and improved products that maximize sustainability. Great Lakes Solutions is dedicated to providing products that are innovative, reliable and also minimize the impact on our environment and human health without sacrificing performance or quality.



Halogen-Free Flame Retardant for Flexible Polyurethane Foam

Emerald Innovation® NH-1 is a halogen-free flame retardant for furniture and automotive flexible polyurethane foam applications. Emerald Innovation™ NH-1 is an innovative, versatile, high performance flame retardant. Emerald Innovation® NH-1 can be used at low load levels and enables production of foams with superior physical properties.

Emerald Innovation® NH-1 offers a host of benefits to flexible polyurethane foam manufacturers. Customers will benefit from using Emerald Innovation® NH-1 because it:

- Is an effective, halogen-free replacement for chlorinated phosphate esters in furniture and automotive flexible polyurethane foam applications
- Is an efficient and effective replacement for current non-halogen alternates to meet California Technical Bulletin 117 flammability requirements
- Exhibits superior scorch resistance which enables better color matching and potentially less waste in production
- Offers reduced emissions resulting in lower odor generation
- Offers reduced fogging and better long-term retention versus chlorinated phosphate esters commonly used in automotive applications
- Is compatible with both polyether and polyester polyols
- Effective in meeting a variety of fire safety standards, including British Standard 5852 Crib V, California Technical Bulletin 117, FMVSS 302 and UL94 HF-1

Contact us today to learn more about how Emerald Innovation® NH-1 can meet your needs in flexible polyurethane foams.

Physical Property Comparison in Flexible Polyurethane Foam

1.5 pcf (24 kg/m³) Cal TB 117 Compliant Polyether Foam

Flame Retardant	Load Level php	Airflow (SCFM)	IFD 25%/65% (Pounds Force)	Average Initial	Average Heat Aged	Part D % Retention
Emerald Innovation® NH-1	19	4.0	45 / 90	0.6 sec / 2.4"	0 sec / 2.3"	97.2
TDCP	14	4.0	41 / 83	0.6 sec / 2.5"	0 sec / 2.7"	98.1
Non-Halogen A	23	3.9	42 / 85	0 sec / 2.4"	0.6 sec / 2.6"	94.3

Tests performed according to ASTM D3574 and California Technical Bulletin 117 guidelines. Note: IFD = Indentation Force Deflection.

1.5 pcf (24 kg/m³) FMVSS 302 Compliant Polyether Foam

Flame Retardant	Load Level php	Airflow (SCFM)	IFD 25%/65% (Pounds Force)	Flammability Rating
Emerald Innovation® NH-1	12	4.0	45 / 90	SE
TDCP	14	4.0	41 / 83	SE
Non-Halogen A	23	3.9	42 / 85	SE

Tests performed according to ASTM D3574 & Federal Motor Vehicle Safety Standard #302 for Interior Materials guidelines. Note: IFD = Indentation Force Deflection. SE = Self Extinguishing. Test specimens are 0.5" (13mm) thick.

⇒ Emerald Innovation® NH-1 matches flammability performance and provides superior physical properties

Great Lakes Solutions Microwave Scorch Test Results

1.5 pcf (24 kg/m³) Cal TB 117 Compliant Polyether Foam

Flame Retardant	ASTM D-1925 ΔE	ASTM D-1925 YI
Emerald Innovation® NH-1	4.36	1.3
TDCP	8.8	14.9
Non-Halogen A	9.8	13.0

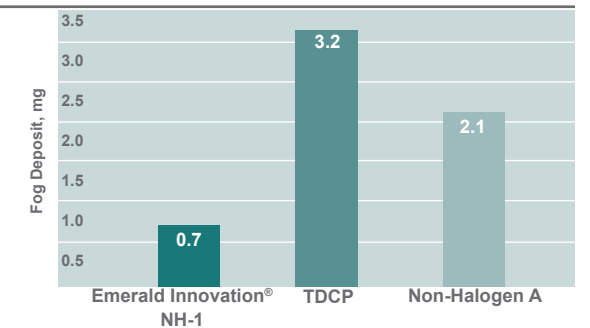


⇒ Emerald Innovation® NH-1 offers superior scorch resistance for demanding applications

Fogging Characteristic of Flexible Polyurethane Foam

1.5 pcf (24 kg/m³) FMVSS 302 Compliant Polyether Foam
Test Method: SAE J1756, ISO 6452, DIN 75 201

⇒ Excellent fogging characteristic suitable for interior automotive applications



UL94 HF-1 Performance in Polyester- Based Formulation

Flame Retardant	Airflow (SCRM)	Afterflame Time	Damaged Length	Flammability Rating (2 & 7 day)
Emerald Innovation® NH-1	2.0	0 sec	22 mm	UL94 HF-1
TDCP	2.0	0 sec	25 mm	UL94 HF-1

⇒ Emerald Innovation® NH-1 remains intact after undergoing harsh accelerated aging to provide exceptional flammability performance.

Component	Parts
Formez® 2C53	100
Water	2-6
Amine Catalyst 1	0.7
Amine Catalyst 2	0.2
Surfactant	1.6
TDI	110 Index
Flame Retardant	21

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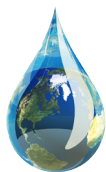
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The information contained herein is correct to the best of our knowledge. Your attention is directed to the pertinent Material Safety Data Sheets for the products mentioned herein.

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Good Chemistry at Work

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