

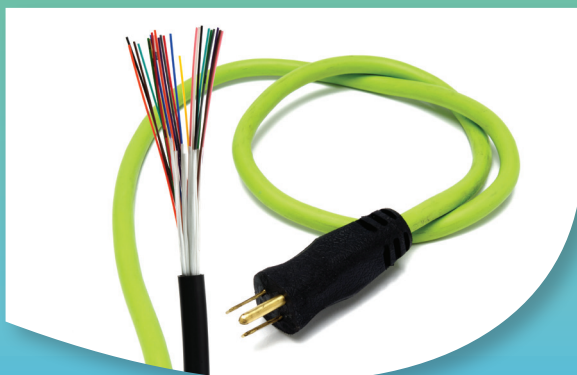
Emerald
Innovation™ 1000

Great Lakes
SOLUTIONS

For a Better Tomorrow

A Chemtura Business

Sustainable, Versatile,
Polymeric Flame Retardant



Great Lakes Solutions: 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.

Emerald 1000
Innovation™

Sustainable, Versatile, Polymeric Flame Retardant

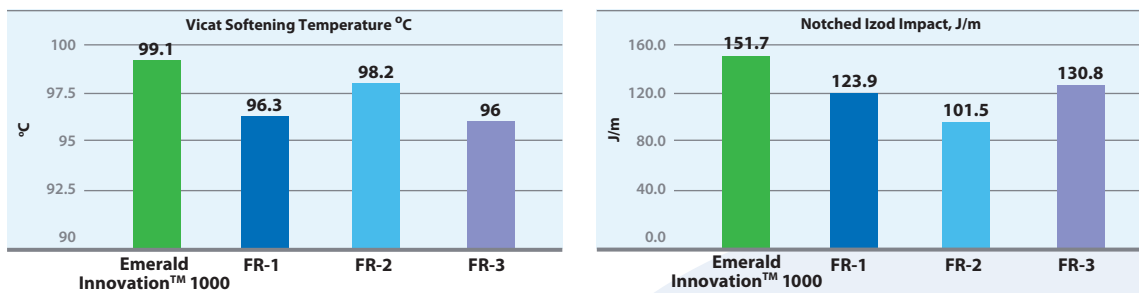
Emerald Innovation™ 1000 is a unique, greener, brominated flame retardant designed to replace Great Lakes DE-83R™ and Firemaster® 2100R or other flame retardants currently used in polystyrene, polyolefin and thermoplastic/thermoset polyester resin systems. This innovative flame retardant is high-performing and cost-effective because:

- Its polymeric structure makes it not readily bioavailable¹, thus reducing the environmental concerns that threaten the sustainability of many current products
- It is an efficient and sustainable replacement requiring little to no reformulation or process changes
- It cost-effectively provides UL-94 V-0 performance in a variety of resins, including HIPS, Polyolefins and Acrylonitrile Butadiene Styrene (ABS)
- Emerald Innovation™ 1000 exhibits excellent recyclability and retention of properties through multiple reprocessing cycles

**Contact us today to learn more
about how Emerald Innovation™ 1000
can be a high-performing, greener flame
retardant solution for your applications.**

¹ Per criteria described in U.S. Federal Register notice 40 C.F.R. 723

Emerald Innovation™ 1000 Performance Comparison in HIPS



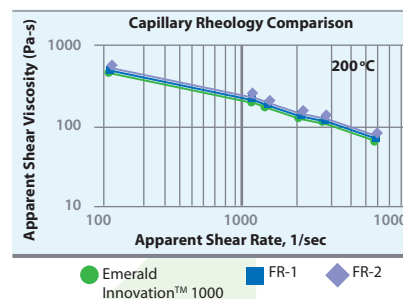
	Emerald Innovation™ 1000	FR-1	FR-2	FR-3
FR Load, %	12.0	12.0	12.0	14.9
UL-94 @ 1.6 mm	V-0	V-0	V-0	V-1*
Notched Izod Impact, J/m	151.7	123.9	101.5	130.8
Gardner Impact, J	6.9	1.5	1.5	4.3
MFI, g/10min, 200 °C/5 kg	11.9	10.9	8.7	15.3
Vicat Softening Point, °C	99.1	96.3	98.2	96.0

All formulations contain 4.0% antimony trioxide *afterglow

Excellent balance of impact, melt flow and thermal properties

Emerald Innovation™ 1000 Performance Comparison in HDPE

	Emerald Innovation™ 1000	FR-1	FR-2
FR Load, %	19.0	19.0	19.0
UL-94 @ 1.6 mm	V-0	V-0	V-0
Tensile Strength, MPa	21.3	20.3	20.3
Tensile Elongation @ Yield, %	8.5	10.1	8.7
Flexural Strength, MPa	23.9	22.4	22.8
Flexural Modulus, MPa	635	611	615



All formulations contain 6.3% antimony trioxide

- Emerald Innovation™ 1000 is an effective alternative for HDPE
- Rheological properties comparable

Emerald Innovation™ 1000 Performance in Talc filled PP, Copolymer

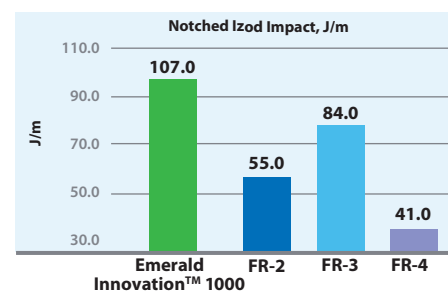
	Emerald Innovation™ 1000	FR-1	FR-2
UL-94, 1.6 mm	V-0	V-0	V-0
Melt flow index, g/10min 230°C/2.16kg	11.4	12.8	11.9
Notched Izod Impact, J/m	33.6	35.8	41.1
Elongation at Yield %	2.29	2.42	2.38

All formulations contain 20% talc, 21% FR and 7% antimony trioxide

- Emerald Innovation™ 1000 is an effective replacement for FR-1 or FR-2 for talc-filled PP
- Excellent performance also demonstrated in PP homopolymer and copolymer

Emerald Innovation™ 1000 Performance in Injection Molding Grade ABS

	Emerald Innovation™ 1000	FR-2	FR-3	FR-4
FR, %	13.0	13.0	16.2	21.7
UL-94 @ 1.6 mm	V-0	V-0	V-0	V-0
Tensile strength, MPa	47.9	46.2	50.1	51.2
Strain at yield, %	3.02	2.66	2.86	2.53
Strain at break, %	15.3	15.1	7.1	3.02
Flexural strength, MPa	75.2	72.9	78.6	72.5
Flexural modulus, MPa	2437	2594	2583	2777
Notched Izod Impact, J/m	107.3	55.0	83.8	41.1
MFI, g/10min, 230 °C/10 kg	29	21	43	73
HDT, °C, 1.8MPa	75.2	76.5	73.8	73.2



All formulations contain 5.0% antimony trioxide and 0.3% PTFE

High efficiency and excellent balance of properties

Legend of Flame Retardants

Label	Chemtura Product Name	Chemical Name
FR-1	DE-83R™	Decabromodiphenyl oxide
FR-2	Firemaster® 2100R	Bis (pentabromophenyl) ethane
FR-3	-	2,4,6-Tris(2,4,6-tribromophenoxy)-1,3,5 triazine
FR-4	-	Brominated epoxy oligomer



For a Better Tomorrow

A Chemtura Business

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