



Opteon™ 1100

Foam Blowing Agent

Product Information

Introduction

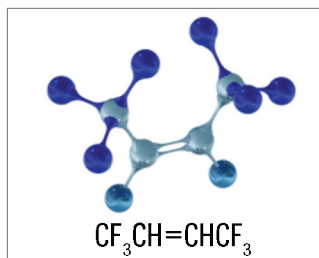
In response to growing needs for high performance products with reduced environmental impact, Chemours has commercialized a new blowing agent, Opteon™ 1100, based on hydrofluoroolefin (HFO) chemistry. Opteon™ 1100 provides an excellent match of physical properties and performance characteristics. Opteon™ 1100 offers a sustainable solution to meet changing regulatory requirements with enhanced performance to replace hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), and hydrocarbons (HCs).

- Ozone Depletion Potential (ODP) = 0 (no chlorine)
- Broadly Registered in All Relevant Regions
- Global Warming Potential (GWP) 100 yr ITH = 2.0 (AR5)
- Atmospheric Lifetime = 22 days (NOAA)
- Photochemical Ozone Creation Potential (POCP) = 3.4
- Molecular Weight = 164
- Boiling Point = 33 °C (91 °F)
- Nonflammable (ASTM E681)
- Workplace Environmental Exposure Limit (WEEL) = 500 ppm 8-hr TWA
- Vapor Thermal Conductivity = 10.7 mW/m-K at 25 °C (77 °F)

Versatile Application

Opteon™ 1100 properties and advantages make it well suited for a variety of polyurethane and polyisocyanurate foam applications, including:

- Spray
- Appliance
- Pour in Place
- Panels
- Integral Skin
- Flotation
- Pipe Insulation
- Bun Stock



An Effective and Safe Alternative

Opteon™ 1100 foam blowing agent features physical properties that make it an extremely effective replacement for HFCs, HCFCs, and HCs in urethane-based foam applications. These properties include an optimum boiling point, low vapor thermal conductivity, and low permeation rate. Opteon™ 1100 offers the added benefits of being nonflammable and having a favorable toxicity profile (**Table 1**). This provides increased safety in use for both workers and consumers.

Table 1. Comparison of Exposure Limits for Commercially Available Blowing Agents

Blowing Agent	OEL (ppm) ¹
Opteon™ 1100	500 ²
HFC-245fa	300 ²
HFC-365mfc	1,000 ⁴
Cyclopentane	600 ³
Methyl Formate	50 ³
HCFO-1233zd-E	800 ²

¹Occupational Exposure Limit (OEL)

²Workplace Environmental Exposure Limit (WEEL) 8-hr TWA

³Threshold Limit Value (TLV), (8-hr TWA)

⁴Supplier-recommended OEL

Superior Chemical Stability and Shelf Life

Opteon™ 1100 foam blowing agent chemical stability has been evaluated by Chemours in both B-side formulations and foams aged at elevated temperatures for up to 6 months. These tests have demonstrated the excellent chemical stability of Opteon™ 1100 in polyurethane systems and foams. The high chemical stability of Opteon™ 1100 results in longer B-side formulation shelf lives compared to those employing other blowing agents. Opteon™ 1100 is also compatible with a wide range of amine catalysts, therefore, allowing for a high degree of flexibility in formulation reactivity and application customization. The high chemical stability of Opteon™ 1100 has been confirmed in field testing and large scale trials.

Opteon™ 1100 Materials Compatibility

Materials compatibility testing for up to 14 days has shown that Opteon™ 1100 foam blowing agent is compatible with the metals, elastomers, and plastics typically used in the storage, handling, and manufacture of foams. No equipment or material of construction changes have been required in field testing and larger scale trials.

Physical Properties

The physical properties of Opteon™ 1100 foam blowing agent compare quite closely to those of HCFC-141b, a major foam blowing agent of choice for polyurethane foams, prior to its phaseout under the Montreal Protocol due to its ozone-depleting properties. Two key Opteon™ 1100 properties, vapor pressure and vapor thermal conductivity, are shown in **Figures 1** and **2**. Opteon™ 1100 is also nonflammable as determined by ASTM E681 – even at temperatures up to 100 °C (212 °F).

Figure 1. Vapor Pressure for Opteon™ 1100 Compared to HCFC-141b and Other Foam Blowing Agents

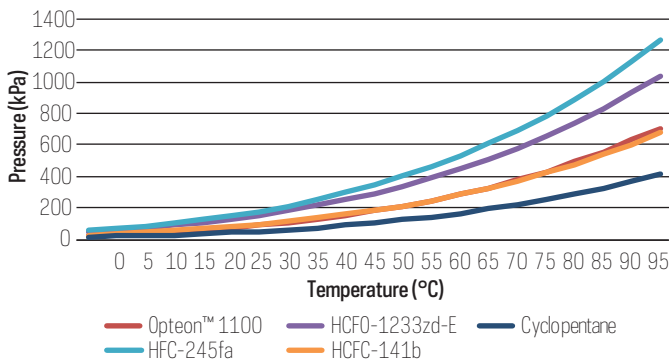
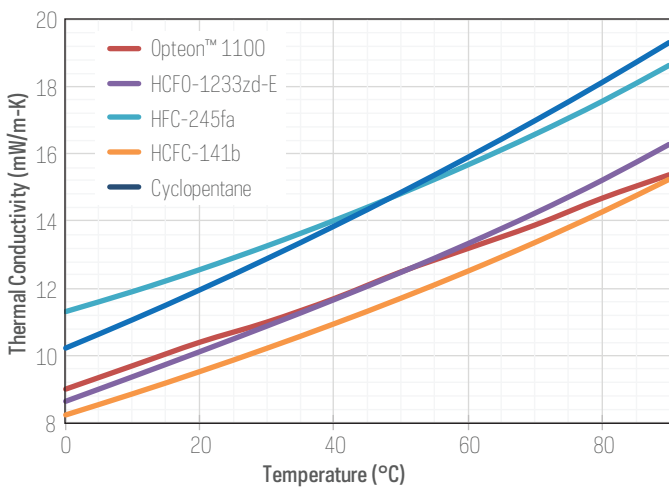


Figure 2. Vapor Thermal Conductivity for Opteon™ 1100 Compared to HCFC-141b and Other Foam Blowing Agents



Opteon™ 1100 Polyol Compatibility

As seen in **Table 2**, Opteon™ 1100 exhibits good solubility in a broad range of polyols. Opteon™ 1100 solubility is generally high in polyether polyols, being completely soluble in most. The solubility of Opteon™ 1100 in polyester polyols is generally lower, ranging from 5 to 30 weight % at room temperature.

Table 2. Opteon™ 1100 Polyol Solubility

Polyol Type	OH Number (mg KOH/g)	Opteon™ 1100 Solubility Limit (Weight %)	
		21 °C (70 °F)	50 °C (122 °F)
Polyethers			
Amine	391-800	5-50	40-50
Sucrose/Amine	400-499	50	50
Sucrose/Glycol	440	50	50
Sucrose/Glycerine	280-520	50	50
Sorbitol	490	50	50
Mannich-Base	300-390	5-50	29-50
Polyesters	240-307	5-30	25-35

Opteon™ 1100: The Best Choice for Polyurethane Foams

As a nonflammable, room temperature liquid with excellent miscibility in many polyols, Opteon™ 1100 provides a safe, easy to handle foam blowing agent for polyurethane applications. The low vapor thermal conductivity and low permeation of Opteon™ 1100 results in the production of polyurethane foams with improved initial and aged k-factors compared to foams prepared with incumbent HFC, hydrochlorofluoroolefin (HCFO), or HC blowing agents. Customer field trials with Opteon™ 1100 have demonstrated superior application behavior coupled with improved, long lasting k-factors.

Opteon™ 1100 Advantages

- High foaming efficiency, including equal weight substitution in some cases
- Improved energy efficiency versus current commercial products in numerous applications
- Excellent thermal stability well-suited for thick pass and high yield applications
- Further performance and cost optimization opportunities by blending Opteon™ 1100 with other blowing agents, including HCs

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