



Propelling Aerosol Technology Forward in Personal Care Products

From deodorants to shaving creams and hairsprays, aerosols are used in many personal care products as an efficient, safe, tamper-proof and controlled method of dispensing material. With the advent of global warming-based regulations in many regions around the world, HFC (hydrofluorocarbon) propellants, such as HFC-134a, HFC-152a and HFC-227ea, have come under pressure as potential contributors to global warming. In response to current and possible future restrictions on the use of HFCs, Honeywell has introduced Solstice® Propellant, which has all the performance benefits of hydrofluorocarbons, but exhibits very favorable environmental properties.

Performance and Cost Effectiveness

Solstice® Propellant offers a high degree of versatility to accommodate the wide variety of products sold in the personal care market. It is nonflammable, and has a moderate vapor pressure of 49 PSIG (3.4 bars-gauge) at 70°F (21°C) and 147 PSIG (10 bars-gauge) at 130°F (54°C).

It mixes with other common propellants such as HFC-134a, HFC-152a, DME, butane, isobutane and propane. While it does not mix with water, it is highly miscible and compatible with many commonly-used solvents, including ethanol, acetone, halogenated solvents and hydrocarbons. It has been shown to be compatible with aluminum chlorohydrate and commonly used hairspray ingredients, and is currently being evaluated in personal care products. Prototype hairspray formulations containing Solstice Propellant, either as the sole propellant or in combination with isobutane, exhibited spray characteristics comparable to those of commercial HFC-152a propelled hairsprays.

Solstice Propellant is thermally and hydrolytically stable and exhibits good compatibility with plastics, elastomers and metals. In particular, Solstice Propellant has been shown to be compatible with unlined tinsplate aerosol exhibited spray characteristics comparable to those of commercial HFC-152a propelled hairsprays.

cans, as well as with PAM, epoxy and PET-lined aerosol cans. Solstice Propellant has also been tested with aerosol valves from the major valve companies, and found to be compatible with common gasket materials, including grades of butyl rubber, buna and neoprene.

Customers have generally found conversion costs to be minimal as Solstice Propellant requires little or no change to existing filling equipment.

Sustainability

When substituted for HFC-152a in personal care aerosol products, Solstice Propellant can substantially reduce greenhouse gas emissions. It has a global warming potential (GWP) of less than 1¹, compared to 124 for HFC-152a². It also has an MIR value of 0.09g O3/g VOC, so it does not contribute to ground-level ozone creation and has been excluded from the definition of VOC by the U.S. EPA.

Safety

Solstice Propellant is a UN class 2.2 nonflammable liquefied gas. The results of an extensive set of toxicity tests support the conclusion that Solstice Propellant exhibits a very low order of toxicity. Accordingly, the American Industrial Hygiene Association (AIHA) has assigned a Workplace Environmental Exposure Limit (WEEL) of 800 PPM (8-hour time-weighted average).

References:

- Hodnebrog, O., Etmann, M., Fuglested, J.S., Marston, G., Myhre, G., Nielson, C.J., Shine, K.P., Wallington, T.J.: Global Warming Potentials and Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review, Reviews of Geophysics, 51, 2013.
- IPCC 2007

For more information

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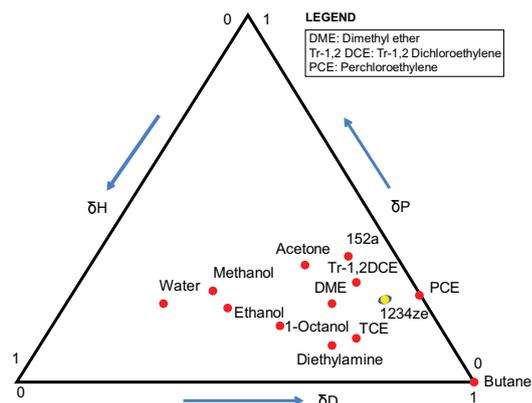
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Regulatory Compliance

Solstice Propellant complies with global regulations. The product is registered in Europe under REACH (Regulation 1907/2006) for tonnages of more than 1,000 tonnes/annum. In the U.S., it was added to the SNAP List of Acceptable Substitutes for Aerosol Applications in June 2010 and was added to the TSCA inventory without restrictions in November 2010. It is also registered in Japan, China, Australia, Canada and South Korea.

Solubility with Common Propellants and Solvents



Key Properties of Solstice Propellant	
Molecular Formula	CHF=CHCF ₃
Molecular Weight	114
Boiling Point	-2.2°F (-19°C)
Vapor Pressure at 70°F/21°C at 130°F/54°C	49 psig 3.4 bars 147 psig 10 bars
Liquid Density at 70°F/21°C	1.17 g/cc
Vapor Flame Limits (Vol.% in Air) Measured at 70°F/21°C	None
Solubility of Water in 1234ze at 68°F/20°C	225 ppm
Solubility of 1234ze in Water at 68°F/20°C	373 ppm

