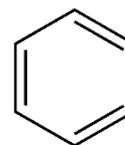




VIRENT BioForm BZ[®] Benzene



Overview

The BioForming[®] process converts plant-derived feedstocks into a BioFormate[®] product that is analogous to petroleum reformat. Similarly to conventional petroleum reformat, Virent's Bioreformat product can be used as a gasoline blendstock or processed to high purity aromatic chemicals using conventional aromatics processing technology. Virent's products are indistinguishable from the petrochemical analogs, except for C-14 dating for bio-content. Using conventional aromatics processing Virent has produced renewable paraxylene, mixed xylenes, toluene, benzene and Aromatic 100.

Key Properties

Composition

BioForm[®] BZ benzene fully meets typical industry standards for high purity benzene. With further refinement of the final distillation, it is expected that cyclohexane grade product is achievable. Common impurities are present at levels at or below those in conventional petrochemical benzene.

Interchangeable

BioForm BZ is a direct drop-in replacement for petrochemical benzene, meeting typical industrial specifications for high purity benzene.

Green House Gas (GHG) Reduction

BioForm BZ helps meet sustainability goals. Depending on the feedstock used to produce BioForm BZ, it will reduce the GHG up to 70% versus petrochemical benzene. Radio carbon dating implies the carbon content of BioForm BZ is bio-based.

TSCA Listing

BioForm BZ is TSCA listed. Product registrations in other regions, including REACH, will be obtained prior to commercialization. Consult the SDS for additional information.

Applications

Benzene is a key building block in the chemical industry. Almost all benzene is converted to other key chemicals including styrene, phenol, cyclohexane and aniline, which in turn are converted into polystyrene, nylon, polyurethanes and polycarbonates, synthetic rubber, lubricants, dyes, detergents, drugs, explosives, and pesticides.

Customer Evaluation

Several leading producers of benzene derivatives have evaluated BioForm BZ and found it to satisfy all testing requirements to date.

Property	Method	Typical Industry Specification	VIRENT	
			Specification	Actual ⁽³⁾
Benzene	ASTM D4492 ⁽²⁾	≥ 99.9 wt%	≥ 99.9 wt%	99.93%
Sulfur	ASTM D5453	≤ 1 ppm	≤ 1 ppm	Pass
Thiophene	ASTM D7011	≤ 0.6 ppm	≤ 0.6 ppm	<0.02 ppm
Toluene	ASTM D4492 ⁽²⁾	≤ 300 ppm	≤ 300 ppm	150 ppm
Nonaromatic hydrocarbons ⁽¹⁾	ASTM D4492 ⁽²⁾	≤ 500 - 1000 ppm	≤ 500 ppm	530 ppm ⁽⁴⁾
Hexane	ASTM D4492 ⁽²⁾	-----	-----	Not detected
Methyl-cyclopentane	ASTM D4492 ⁽²⁾	-----	-----	51 ppm
Methyl-cyclohexane	ASTM D4492 ⁽²⁾	-----	-----	Not detected
Appearance	ASTM D2090	Clear and sediment-free	Clear and sediment-free	Pass
Color, maximum	ASTM D1209	20	20	4
Mean Biobased Content	C-14	N/A	>99%	100% ⁽⁵⁾

(1) Total, includes other non-aromatic hydrocarbons listed separately
(2) Method modification available upon request
(3) Production Lot C0201D-OP25901
(4) Refinement of distillation will achieve specification value.
(5) Based on co-product analysis

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