

## Green Biologics nC4-OL (Renewable n-Butanol)

### What is Renewable n-Butanol?

Green Biologics nC4-OL is 100 % renewable n-butanol produced through fermentation of agriculturally derived sugars by Green Biologics' proprietary *Clostridium* microbial biocatalysts. As Green Biologics' n-butanol is selectively produced by bacteria, and not by processing petroleum distillates, we can provide high quality material, with very low water content with an improved contaminant profile of traditional petrochemical synthetic pathways.

### n-Butanol Basics

Molecularly identical to petro-butanol, Green Biologics nC4-OL is a four-carbon alcohol that is a clear, colorless, flammable and neutral liquid with a characteristic banana-like odor. The medium volatility and restricted miscibility in water of n-butanol make it useful as both a solvent and a formulated ingredient in cosmetic and personal care products.

### Applications

The largest market for n-butanol and butyl derivatives is paints, coatings, adhesives, and inks. However, the robust solvent properties of n-butanol make it a versatile oxo-chemical with many other direct applications such as extractions and flavor additives. Additionally, n-butanol is a valuable feedstock for the production of higher value chemicals, chiefly ethers and esters. Aside from its use as a solvent, alcohol plasticizer, and additive in formulated consumer products, n-butanol is commonly used for the manufacturing of esters utilized for fragrance and skin care in personal care goods. Cosmetic products that utilize n-butanol in their formulations include eye makeup, foundations, lipsticks, nail care products, personal hygiene products, shaving creams, and moisturizers.

### Specifications

Property Tested	Value or Range	Test Method
Total purity	≥ 99.8 %	GC
Di-n-butyl ether	≤0.02 %	GC
Aldehydes	≤0.05%	GC
Isobutanol	≤ 250 ppm	GC
Water	≤ 500 ppm	ASTM E1064
Acidity (as Acetic Acid)	≤ 0.003 wt%	ASTM D1613
Color (APHA; Pt/Co)	≤ 10	ASTM D1209
Appearance	Clear; Colorless	ASTM D4176 and visual
Nonvolatile matter wt%	< 5 mg / 100 mL	ASTM D1353
Specific gravity @ 20/20 °C	0.810 - 0.813	ASTM D4052
Distillation range	< 1.5 °C	ASTM D1078
Renewable Carbon wt %	100 %	ASTM D6866