Renewable chemicals naturally designed and engineered to deliver the performance that adds value to everyday products

Butachem™ (Renewable n-Butanol)

What is Butachem™?

Butachem™ is 100 % renewable n-butanol produced through fermentation of C_5 and C_6 sugars by Green Biologics' proprietary *Clostridium* microbial biocatalysts. As Butachem™ is selectively produced by bacteria, and not by processing crude petroleum distillates, we are capable of providing higher quality material that contains none of the common contaminants of traditional routes (i.e. isobutanol and aldehydes) as well as low water content (< 100 ppm).

n-Butanol Basics

Molecularly identical to petro-n-butanol, Butachem™ is a four-carbon alcohol that is a clear, colourless, flammable and neutral liquid with a characteristic banana-like odour. 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 robust solvent properties of n-butanol make it a versatile oxo-chemical with several direct applications such as extractions and flavour 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 utilised for fragrance and skin care in personal care goods. Cosmetic products that utilise n-butanol in their formulations include eye makeup, foundations, lipsticks, nail care products, personal hygiene products, shaving creams, and moisturizers.

Health and Toxicity

Like the ubiquitous two-carbon alcohol ethanol, n-butanol is a relatively safe chemical for use in cosmetics, food additives, and personal care products. Acute overexposure to the chemical results in symptoms comparable to overexposure to other generally benign chemicals (i.e. ethanol or sodium chloride) and include irritation of the eyes, skin, and mucus membranes. Other effects of exposure to n-butanol mirror those of short-chain alcohols (i.e. ethanol and isopropanol) and include central nervous system depression. These concerns aside, n-butanol has not been shown to cause cancer or any DNA damage. In most cases, n-butanol is rapidly metabolized to carbon dioxide and readily excreted *via* respiration. n-Butanol is also essentially non-toxic to aquatic life and birds with regards to acute exposure. Furthermore, n-butanol is readily biodegradable, which combined with our renewable process, makes the use of Green Biologics' Butachem™ environmentally benign from start to finish.

Environmental Impacts

Several natural sources emit a significant amount of n-butanol into the environment. Plants (rye and grass), trees (beech, birch, and hornbeam), animal waste, microbes, and insects all naturally emit n-butanol into the environment. While less volatile than other chemicals, n-butanol is a volatile organic compound (VOC) with a boiling point of 243.3 ˚F (117.4 ˚C). However, n-butanol is readily degraded in water and in air (by photo-degradation). Despite its classification as a VOC, n-butanol is more likely to be dissolved in water than evaporate, where it is largely non-toxic to aquatic species and is rapidly degraded. Adsorption of n-butanol into soil is possible, however bioaccumulation and/or bio-concentration are unlikely considering the rapid degradation of the compound.

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greeninside™ renewable by design