GreenBiologics

Naturally designed and engineered to deliver the performance that adds value to cosmetic and personal care products

Cosmetics and Personal Care Formulation Additives

100 % Renewable Esters

Green Biologics is a producer of 100% renewable n-butanol which we aim to transform into higher value chemicals for the cosmetics and personal care industry. A number of butyl esters utilised in cosmetics, fragrances and personal care applications are partially bio-based as they are produced from carboxylic acids derived from natural oils. As a producer of renewable n-butanol, we aim to partner with these producers to utilize our renewable n-butanol to provide 100 % renewable butyl esters to the industry and consumers.

Acetone - Our brand name for our 100% renewable acetone is GB-C3-ONE™. Produced through fermentation of C_5 and C_6 sugars, our acetone is a drop-in equivalent to petroleum-based acetone. Our high purity GB-C3-ONE™ will be EU and US natural and is completely renewable and free of carcinogenic aromatic impurities. These properties allow formulators to use our renewable acetone without changing time-tested recipes whilst adding sustainability to their marketing claims.

Butyl Acetate - An ester used in a variety of cosmetics and personal care applications, butyl acetate is used as a solvent in nail polishes and as an additive in nail treatments to prevent nail chipping.

Butyl acetate is also used as fragrance additive which adds a diffusive ethereal odour resembling fermented rum. Butyl acetate is common in banana, butter, pineapple, raspberry, and strawberry flavoured or scented products. It is produced from n-butanol and acetic acid, the primary component of vinegar. Acetic acid can be produced using renewable methods.

Butyl Avocadate – One of the most highly valued butyl esters in the cosmetics and personal care realm, butyl avocadate has been shown to be a selective inhibitor of 5-α Reductase Type 1, an enzyme responsible for the production of oils on the face and in hair. The addition of this ester to hair care and skin conditioning products facilitates the removal of grease and oil in skin secretions by selective inhibition of the enzyme responsible for their presence, not by drying out the hair or skin. Avocadic acids are naturally isolated from avocados.

Butyl Babassuate - A versatile ester used in a wide array of cosmetic products as an emollient, emulsion stabilizer, skin conditioner, and non-ionic surfactant. Commonly used as a skin conditioner in self-tanning formulations. Babassuic acid is a fatty acid derived from the seeds from *Orbignya oleifera*, the babassu palm tree.

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greeninside® renewable by design

Butyl Lactate - While most commonly utilised as a flavour and fragrance additive in cosmetics and personal care applications, butyl lactate is also used as a solvent for creams, lotions, fragrances, and soaps. As a flavour and fragrance additive, this ester adds synthetic butter, butterscotch, caramel, or fruit notes to formulations. Lactic acid is produced naturally in the human body and thus is both natural and safe. Fermentation technology has allowed the renewable production of lactic acid making butyl lactate a key target for Green Biologics as a 100% renewable ester.

Butyl Myristate - An ester used in the production of face and other protective creams, lipsticks, and both nail polishes and nail polish removers. Butyl Myristate is also used as a diluent for cosmetics and fragrances. Myristic acid is a common saturated fatty acid that is named after the nutmeg plant *Myristica fragrans*. Nutmeg butter consists primarily of trimyristin which is a triglyceride of myristic acid and thus provides a natural platform for this component's isolation.

Butyl Oleate - This ester is a common additive to creams and lotions as a stabilizer and as an emollient to increase the moisturizing properties of the formulation. Oleic acid is a monounsaturated fatty acid that is common in many animal and vegetable oils and fats. Its name derives olive oil, of which oleic acid is the primary component.

Butyl Palmitate - The primary component responsible for providing the glossy shine indicative of clean and healthy hair. Palmitic acid is the most common saturated fatty acid found in animals, microorganisms, and plants. Palmitic acid is the major component of all parts of palm trees, including palm oil, palm kernels, and palm kernel oil.

Butyl Stearate - A valuable chemical used as a binder in cosmetics, butyl stearate is also utilised in skin conditioners and in surfactants for cosmetics formulations. Products that commonly contain this ester include detergents, soaps, shampoos, and shaving creams. Stearic acid is an 18-carbon chain carboxylic acid that is commonly found in animal and vegetable fats and oils. While much more common in animal than vegetable fats, it is a large component of cocoa and shea butter (28–45%).

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Flavour and Fragrance Additives

Many butyl esters are used as flavour and fragrance additives in the cosmetics and personal care industry in a wide range of applications. Examples of esters which could be 100% renewable using the corresponding naturally occurring or bio-derived carboxylic acid include:

- Butyl angelate – Commonly found in the volatile organics of flowers; adds a floral note. *Trans*-isomer of butyl tiglate.
- Butyl butyrate – Naturally occurring ester found in apples, bananas, berries, pears, plums, and strawberries and can be used to add these flavours or fragrances to a formulation.
- Butyl caprylate – Fruity odour; used as an apple, banana, citrus, pear, plum, strawberry, tomato, and tutti-fruitti flavour and/or fragrance.
- Butyl cinnamate – Butyl ester made from *n*-butanol and cinnamic acid taken from cinnamon. Adds chocolate, cocoa, and fruit flavours and/or fragrances.
- Butyl heptanoate – Synthetic fruit and liquor flavour and fragrance additive.
- Butyl hexanoate – Fruity, berry flavour and fragrance additive.
- Butyl isobutyrate – Synthetic banana, butter, cherry, raspberry, and strawberry flavour and fragrance additive.
- Butyl isovalerate – Herbaceous, fruity ester with a sweet apple-like taste. Can be used as a fruit or chocolate flavour or fragrance additive.
- Butyl laurate – A diverse additive capable of providing apple, cape gooseberry, malt whiskey, papaya, or spineless monkey orange notes to formulations.
- Butyl levulinate – Another synthetic butter, fruit, and rum flavour and fragrance additive.
- Butyl tiglate – Chiefly a fragrance additive that provides a floral, herbaceous odour with slight fruity notes. *Cis*-isomer of butyl angelate.
- Butyl undecanoate – Long-chain fatty acid ester. Adds apple cider, butter almond, butter maple, butter pecan, butter toffee, cognac, and whiskey flavours or fragrances to formulations.
- Butyl valerate – Synthetic butter, chocolate, and fruit flavour and/or fragrance additive.

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