

Reliable and consistent production of important terpenoids

Optical dissolved oxygen measurement in presence of saturated hydrocarbons

Industry: Flavor and Fragrance

Application: Fed-Batch Fermentation

Hamilton products: VisiFerm DO Arc with H2 cap

Terpenoids are a large class of naturally occurring organic chemicals. Plant derived terpenoids are used extensively for their aromatic qualities as they contribute to the scent of eucalyptus, the flavors of cinnamon, and ginger, the yellow color in sunflowers, and the red color in tomatoes. Well-known terpenoids include citral, menthol and others. A commercially important example is valencene, which is present in various citrus species. Valencene gives a juicy impression and is mainly used in flavors for the beverage industry (Citrus), and in fragrances. It's also used as starting chemical for the production of nootkatone which provides a grapefruit-like flavor. As any natural ingredient its concentration depends on seasonal influences and the harvest. Traditionally terpenoids like valencene are extracted from fruit or vegetable components like orange peel. Therefore the current supply chain of many natural compounds is unstable and characterized by high volatility regarding availability, quality and pricing. As a consequence flavorists need to adjust their formulations frequently.

The process

In order to supply valencene at constant quality whenever needed Isobionics developed a microbial fermentation process in its R&D facility in Geleen, the Netherlands. During this fermentation process *Rhodobacter* species convert sugar to valencene. Due to the low solubility of terpenoids in water, the production process might require an addition of an organic solvent like saturated hydrocarbons to the fermentation broth. This enhances the removal of the products from the fermentation broth during down-stream processing.

Benefits of VisiFerm DO with H2 cap

- Protective layer makes optical technology suitable for some organic solvents
- Instant start-up without polarization
- Easy maintenance
- Low upfront costs due to integrated micro-transmitter



VisiFerm DO Arc 120
HAMILTON

H2 caps ensure reliable DO measurements

In Isobionics applications, parameters such as pH and dissolved oxygen (DO) need to be monitored accurately. For instance, to apply dissolved oxygen-dependent feeding protocols during fed-batch fermentation, precise and steady DO measurements are key. In the fermentation process, optical DO sensors equipped with conventional silicon-based caps did not survive long enough if they were in contact with the terpenoids or the organic phase of the fermentation broth for several days. Due to the unsaturated character terpenoids enter the silicone and form photochemical radicals in contact with the intense blue light of the sensor. Subsequently the luminophore, the oxygen sensitive layer, degrades quickly. Therefore, Isobionics uses Hamilton VisiFerm DO Arc sensors equipped with chemically resistant H2 caps. The protective PTFE layer blocks organic compounds like unsaturated fatty acids or terpenoids. This ensures a steady and reliable DO signal that can be used to control the process. With this key benefit VisiFerm DO helps to increase the reliability of Isobionics' process development R&D program, resulting in a reproducible production process and hence a secure supply chain of valencene. Isobionics customers like flavorists now can rely on constant quality and availability of terpenoids and adjustments of the formulations are no longer necessary.



Figure 1: Installation of VisiFerm DO in a bioreactor in R&D lab.

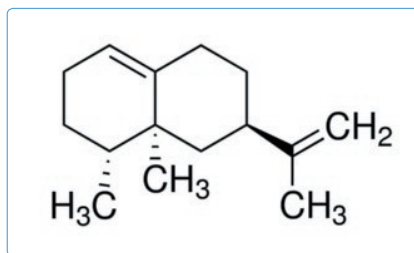


Figure 2: Chemical structure of valencene.

Isobionics
Innovative creators of flavors and fragrances

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