5-Butyl-4-methyloxolan-2-one

γ-Octalactone derivative offers oak flavor versatility in alcoholic drinks, dairy and sweet flavorings

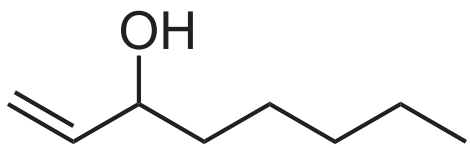
John Wright; johnwrightflavorist@gmail.com

Many years ago, some fortunate soul discovered that storing wine in oak casks not only helped wine withstand hazardous sea voyages—it also added a unique and pleasantly harmonious extra profile to the wine. That novel storage method was later used with spirits, especially whiskey. Today, the vast majority of modern wine and spirits still have a subtle (or not so subtle) addition of oak notes despite the trend of some wines being proudly promoted as "unoaked."

Oak flavor is complex and is often described in wine writing as "vanilla" or "smoky." These dominant notes can be very obvious and can often beget complaints that oak has been overdone. However, one of the most interesting and positive components of the complex character of oak is 5-butyl-4-methyloxolan-2-one, commonly referred to as whiskey lactone (FEMA# 3803, CAS# 39212-23-2; **F-1**). This chemical is basically a derivative of γ-octalactone (FEMA# 2796, CAS# 104-50-7) with an added methyl group in the 3 position. It can exist as a *cis* or a *trans* isomer, the *cis* isomer being of more interest. The character is a highly attractive mélange of creamy, coconut and coumarinic notes. It can function well either as a key component of a range of flavors or as an interesting modifier in a much wider scenario. Still, it's not an easy ingredient to replace because its character is so complex. γ-Octalactone and also γ-nonalactone (FEMA# 2781, CAS# 104-61-0) are somewhat similar, but both are much coarser and notably less versatile.

The dose rates, expressed as parts per million (ppm), throughout this article are the levels suggested for use in flavors that are intended to be dosed at 0.05% in a ready-to-drink beverage or in a simple bouillon. The dose rates indicated in the first two categories, alcoholic drink and brown flavors, both assume that 5-butyl-4-methyloxolan-2-one is used as a key ingredient. The dose rates in all of the other categories assume that it is used primarily as a modifier and that other lactones would also be used in the flavors.

5-Butyl-4-methyloxolan-2-one **F-1**



Alcoholic Drink Flavors

Whiskey: Levels of use can vary dramatically depending on the overall character of the whiskey, but 2,000 ppm in a flavor is a good place to start for a whiskey character that has a noticeable, but not dominant, oak profile.

***Dark rum*:** The effect in rum flavors is similar; however, the optimum levels of use are a little lower, around 1,000 ppm, in a flavor.

***Light rum*:** Although the overall character of white rum flavors is much less aggressive than dark rum flavors, the optimal level of this chemical in a flavor is only a little less, around 600 ppm.

***Brandy*:** Brandy flavors have a slightly more restrained oak character and 300 ppm is a good starting point.

***Beer*:** The levels of use in beer are much lower because an oak note is not the main objective. Around 50 ppm in a flavor is effective.

Brown Flavors

***Caramel*:** A level of 300 to 500 ppm of this ingredient is very attractive in caramel, toffee and other similar styles of flavors.

***Maple*:** A level of 200 ppm is a good level in realistic-style maple syrup flavors, adding realism, depth and sweetness.

***Cocoa and chocolate*:** The effect is quite noticeable at around 200 ppm in a flavor and adds depth, realism and a sweet background note.

***Vanilla*:** At 100 ppm, the influence of 5-butyl-4-methyloxolan-2-one gives an extra degree of authenticity as well as a bean character to vanilla flavors. If a specifically French style of vanilla flavor is required, the coumarinic note of this ingredient is very useful and the level can be doubled.

***Coffee*:** This category of flavor can tend to be overly pungent, sulfury and thin. Even 50 ppm can deepen and sweeten the character.

Dairy Flavors

***Cheese*:** This ingredient would never be used as the main lactone in a cheese flavor, but it can smooth the profile and add realism at a surprisingly high level, around 2,000 ppm, in a flavor.

***Butter*:** Somewhat lower levels in the region of 1,000 ppm can provide a similar smoothing effect in butter flavors. Slightly higher levels can be effective in cooked butter or ghee flavors.

***Cream*:** Lower levels again are used in cream flavors to obtain the same effect. A level of 200 to 400 ppm in flavors is a good range to try.

***Milk*:** In fresh milk flavors, 200 ppm is similarly effective and slightly more effective in cooked or condensed milk profiles.

Fruit Flavors

***Peach*:** 5-Butyl-4-methyloxolan-2-one would never dominate the lactone composition of a peach flavor, but it can add an interesting level of complexity and realism at around 100 to 200 ppm in a flavor.

***Apricot*:** The same range of concentrations is also effective in apricot flavors as a secondary note.

***Strawberry*:** A slightly lower level, in the region of 100 ppm, is effective and carries out a very similar function of modifying the dominant peachy lactone note.

***Banana*:** A level of 100 ppm is a good starting point in banana flavors and adds welcome complexity.

***Mango*:** In mango flavors, 50 to 100 ppm is useful, depending on the degree of ripeness, and will add noticeably to authenticity.

***Pineapple*:** In pineapple flavors 50 ppm is also effective, especially those with a fresh fruit character, adding realism.

***Cherry*:** Fifty ppm adds complexity and authenticity to a wide range of different styles of cherry profiles.

***Raspberry*:** Even low levels, around 20 ppm, can be helpful in ripe raspberry flavors.

Nut Flavors

***Hazelnut*:** This ingredient isn't an obvious material of choice for nut flavors, but it can be surprisingly effective at around 200 ppm in hazelnut flavors.

***Peanut*:** Similar levels of 5-butyl-4-methyloxolan-2-one have a similar effect in peanut flavors and help round out the flavor and counterbalance earthy notes.

Other Flavors

***Barley*:** Barley flavors can be quite challenging when realism is the objective. 5-Butyl-4-methyloxolan-2-one plays a useful part in the overall flavor complex at levels in the region of 200 ppm.

***Barbeque*:** The authentic character of grilled food is also hard to replicate. Here, a level of 100 ppm in a flavor can be helpful.