



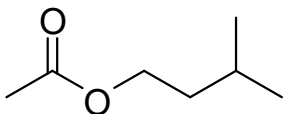
The origin of the aroma of *Honkaku shochu* and *Awamori*

National research institute of brewing

Flavor wheel of *Honkaku shochu* • *Awamori*



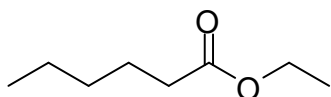
Code Term	
Compound CAS Number, Molecular Weight Structural formula	Picture image Detection threshold: ● ● μg/L Associated term(s) : ● ● Characteristics : Origin :

111 Isoamyl acetate	
Isoamyl acetate CAS 123-92-2, MW 130.2 	 Detection threshold: 240 μg/L Associated term(s) : Banana Characteristics : This ester gives some fruit its distinctive aroma, often reminiscent of banana. Origin : Mainly produced by yeast during fermentation. In sake, yeast with an enhanced capacity to produce isoamyl alcohol will generate high levels of this compound.

112 Ethyl caproate



Ethyl caproate
CAS 123-66-0, MW 144.2



Detection threshold:
15 µg/L

Associated term(s) : **Apple**

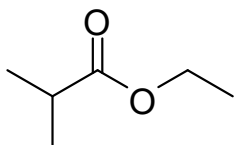
Characteristics : This ester produces a sweet aroma reminiscent of apples.

Origin: Mainly produced by yeast during fermentation. Highly productive yeasts also exist. This compound is also abundant in *sake-kasu* (sake lees) *shochu* made from *ginjo* lees.

113 Ethyl isobutyrate



Ethyl isobutyrate
CAS 97-62-1, MW 116.2



Detection threshold:
3.9 µg/L

Associated term(s) : **Pineapple**

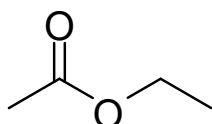
Characteristics: A sweet aroma reminiscent of fruit and pineapple

Origin: Mainly produced by yeast during fermentation. In sake, it is known to increase during storage.

120 Ethyl acetate



Ethyl acetate
CAS 141-78-6, MW 88.1



Detection threshold:
29000 µg/L

Associated term(s) : Ester, Ethyl acetate

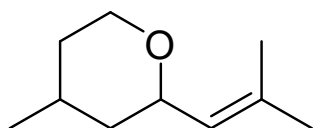
Characteristics: (If in excess) An aroma like that of nail polish remover or glue or overripe melon

Origin: Mainly produced by yeast during fermentation. It is widely included not only in *honkaku shochu* and *awamori*, but also in other distilled spirits.

210 Rose oxide



Rose oxide
CAS 16409-43-1, MW 154.3



Detection threshold:
0.058 µg/L

Associated term(s) : Flowery

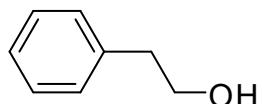
Characteristics: Sweet and gorgeous floral aroma

Origin: In the production of sweet potato *shochu*, citronellol in the mash is converted by an acid-catalyzed chemical conversion action in the fermentation process, and the conversion is accelerated in the distillation process.

211 β -Phenethyl alcohol



β -Phenethyl alcohol
CAS 60-12-8, MW 122.2



Detection threshold:
18000 $\mu\text{g/L}$

Associated term(s) : **Rose**

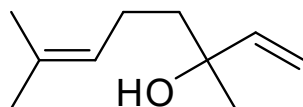
Characteristics: Pleasant floral aroma like that of roses

Origin: Produced in association with phenylalanine metabolism in yeast. It depends on the amino acid composition and the total amount of nitrogen source in the mash.

212 Linalool



Linalool
CAS 78-70-6, MW 154.3



Detection threshold:
6.6 $\mu\text{g/L}$

Associated term(s) : **Lavender**

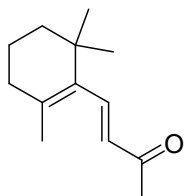
Characteristics: Floral aroma of lavender and lily of the valley

Origin: In the production of sweet potato *shochu*, monoterpene glycosides in sweet potatoes are degraded by enzymes in the *koji*, and then converted to linalool by the acid and heat of distillation.

213 β -Ionone



β -Ionone
CAS 79-77-6, MW 192.3



Detection threshold:
1.7 $\mu\text{g/L}$

Associated term(s) : **Fragrant olive**

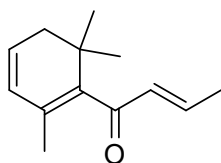
Characteristics: An aroma reminiscent of violet flowers.

Origin: It is often formed when orange sweet potatoes are used in the production of sweet potato *shochu*. A relationship with β -carotene has been suggested.

214 β -Damascenone



β -Damascenone
CAS 23696-85-7, MW 190.3



Detection threshold:
0.0083 $\mu\text{g/L}$

Associated term(s) : **Honey, Sweet flowery**

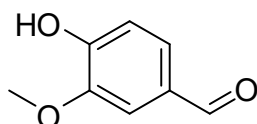
Characteristics: Aroma of roses and honey or a sweet aroma like that of black tea and apple compote.

Origin: The characteristic aroma of sweet potato *shochu*. Most of the free β -damascenone is formed in the latter half of the distillation process.

311 Vanillin



Vanillin
CAS 121-33-5, MW 152.2



Detection threshold:
230 µg/L

Associated term(s) : **Vanilla**

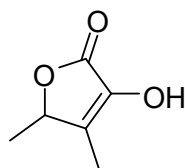
Characteristics: Sweet aroma characteristic of vanilla, the main flavor component of vanilla bean.

Origin: Imparted to alcoholic beverages by cask storage. The compound is also produced in *kusu* (matured *awamori*) that has been stored.

312 Sotolon



Sotolon
CAS 28664-35-9, MW 128.1



Detection threshold:
9.4 µg/L

Associated term(s) : **Caramel**

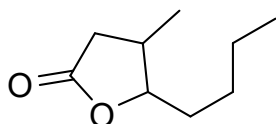
Characteristics: Sweet notes of caramel, burnt sugar, and maple syrup.

Origin: It is produced by storing *awamori* in an earthenware jar. The compound's involvement in the aroma of *kusu* has been suggested.

313 Whiskey lactone



Whiskey lactone
CAS 39212-23-2, MW 156.2



Detection threshold:
40 µg/L

Associated term(s) : **Coconut**

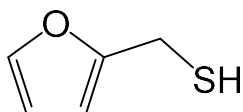
Characteristics: A sweet aroma reminiscent of coconut.

Origin: Imparted to alcoholic beverages by barrel storage.
This compound is the characteristic aroma of oak barrel storage.

411 2-Furanmethanthiol



2-Furanmethanthiol
CAS 98-02-2, MW 114.2



Detection threshold:
0.0016 µg/L

Associated term(s) : **Coffee, Roast**

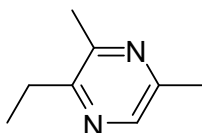
Characteristics: A savory aroma reminiscent of coffee or a pungent burnt aroma.

Origin: It is generally produced in the heating process of foods. The compound may also transfer from roasted raw materials. It is considered to contribute to the characteristics of barley shochu distilled at atmospheric pressure.

412 2-Ethyl-3,5-dimethylpyrazine



2-Ethyl-3,5-dimethylpyrazine
CAS 13925-07-0, MW 136.2



Detection threshold:
5 µg/L

Associated term(s) : **Nuts, Roast**

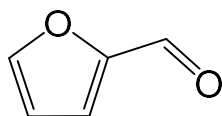
Characteristics: Nutty, cocoa-like aroma.

Origin: It is generally produced in the heating process of foods. The compound is relatively abundant in barley *shochu* and brown sugar *shochu*.

420 Furfural



Furfural
CAS 98-01-1, MW 96.1



Detection threshold:
15000 µg/L

Associated term(s) : **Smoky**

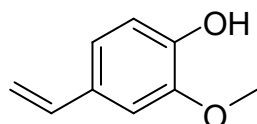
Characteristics: Smoky and sweet aroma.

Origin: Formed when sugars are heated under low pH conditions by citric acid during distillation. The compound is abundant in the latter fraction of the distilled spirit.

430 4-Vinylguaiacol



4-Vinylguaiacol (4-VG)
CAS 7786-61-0、MW 150.2



Detection threshold:
57 µg/L

Associated term(s) : **Smoked**

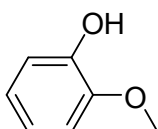
Characteristics: A thick aroma, reminiscent of smoked food

Origin: It is produced by the release and decarboxylation of ferulic acid derived from raw materials by the enzyme of *shochu koji* fungi. The compound is also produced by heating in the distillation process.

440 Guaiacol



Guaiacol
CAS 90-05-1、MW 124.1



Detection threshold:
18 µg/L

Associated term(s) : **Medicinal**

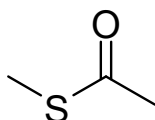
Characteristics: Chemical-like aroma characteristic of phenolic compounds or an aroma reminiscent of disinfectant.

Origin: It is known to exist abundantly in sweet potato *shochu*. In whisky, it is contained mainly in the peat smoke.

510 S-Methyl thioacetate



S-Methyl thioacetate
CAS 1534-08-3, MW 90.2



Detection threshold:
50 µg/L

Associated term(s) : **Sulfide**

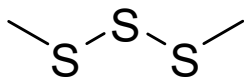
Characteristics: A sulfuric compound aroma reminiscent of eggs.

Origin: In beer, it is known to be produced by yeast from methanethiol, also a sulfur compound, and methionine, an amino acid.

511 Dimethyl trisulfide



Dimethyl trisulfide (DMTS)
CAS 3658-80-8, MW 126.3



Detection threshold:
0.037 µg/L

Associated term(s) : **Japanese pickles**

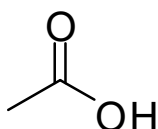
Characteristics: An aroma reminiscent of Japanese pickled vegetables such as *takuan*; a sulfur compound aroma.

Origin: It is thought that sulfur-containing amino acids in the mash are involved; the compound is relatively abundant in *awamori*.

610 Acetic acid



Acetic acid
CAS 64-19-7, MW 60.1



Detection threshold:
39000 µg/L

Associated term(s) : **Acetic smell**

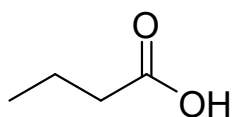
Characteristics: Stimulating aroma of vinegar or an acetic smell.

Origin: Mainly produced by yeast. The amount produced increases particularly in the production of brown sugar *shochu* due to the high temperature and high sugar concentration.

621 Butyric acid



Butyric acid
CAS 107-92-6, MW 88.1



Detection threshold:
1300 µg/L

Associated term(s) : **Cheese**

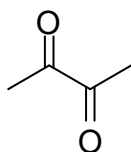
Characteristics: Cheese or buttery aroma.

Origin: Formed when the mash is contaminated by microorganisms.

622 Diacetyl



Diacetyl
CAS 431-03-8、MW 86.1



Detection threshold:
5.6 µg/L

Associated term(s) : **Yogurt**

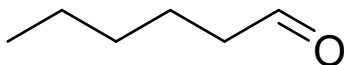
Characteristics: Yogurt-like aroma or sweet aroma

Origin: When purple sweet potatoes are used, the compound is thought to accumulate as a result of anthocyanins inhibiting the yeast's diacetyl metabolism. The compound is also produced through contamination by lactic acid bacteria, etc.

710 Hexanal



Hexanal
CAS 66-25-1、MW 100.2



Detection threshold:
20 µg/L

Associated term(s) : **Herbal**

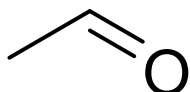
Characteristics: Green scent of grass and soybeans. When in excess, it is perceived as an oxidized oil odor.

Origin: Produced by the breakdown of long-chain fatty acids such as linoleic acid.

711 Acetaldehyde



Acetaldehyde
CAS 75-07-0, MW 44.1



Detection threshold:
9000 µg/L

Associated term(s) : **Aldehyde, Herbal**

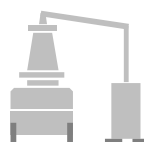
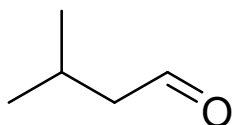
Characteristics: A light aroma reminiscent of wood, grass, and green apple.

Origin: There are two routes: where it is produced by yeast from amino acids, and where it is produced by heating and decomposing amino acids during distillation; the compound is abundant in first pours from the outlet.

721 Isovaleraldehyde



Isovaleraldehyde
CAS 590-86-3, MW 86.1



Detection threshold:
3.6 µg/L

Associated term(s) : **Stuffy smell, Solvent**

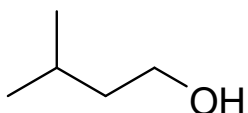
Characteristics: Stimulating aroma, sometimes described as savory.

Origin: Formed from leucine by yeast metabolism during fermentation. The compound is thought to be produced by Strecker degradation in heating during distillation.

722 Isoamyl alcohol



Isoamyl alcohol
CAS 123-51-3, MW 88.2



Detection threshold:
33000 µg/L

Associated term(s) : Ink, Solvent, Alcohol

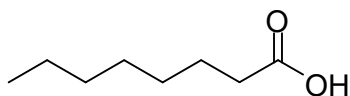
Characteristics: Aroma like that of higher alcohol or ink.

Origin: Produced in association with leucine metabolism in yeast. It depends on the amino acid composition and the total amount of nitrogen source in the mash.

810 Caprylic acid



Caprylic acid
CAS 124-07-2, MW 144.2



Detection threshold:
1500 µg/L

Associated term(s) : Oily, Resin

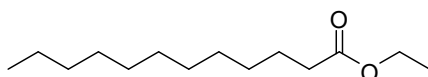
Characteristics: A slightly heavy aroma reminiscent of oil or resin.

Origin: An intermediate in the fatty acid synthesis pathway of yeast. The more active the yeast growth and the higher the nitrogen/carbon ratio in the growth environment, the greater the amount produced.

820 Ethyl laurate



Ethyl laurate
CAS 106-33-2, MW 228.4



Detection threshold:
99 µg/L

Associated term(s) : **Soapy, Oily**

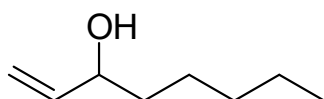
Characteristics: A slightly heavy scent reminiscent of oil or soap.

Origin: Formed when lipids derived from raw materials are degraded by enzymes and compounded with ethanol. Since it is also produced during maturation, it is also abundant in *kusu* (matured *awamori*).

830 1-Octen-3-ol



1-Octen-3-ol
CAS 3391-86-4, MW 128.2



Detection threshold:
5.0 µg/L

Associated term(s) : **Mushroom**

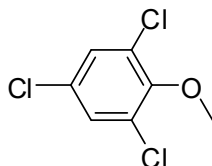
Characteristics: An aroma reminiscent of mushrooms such as matsutake; also known as *matsutakeol*.

Origin: It is an ingredient derived from *koji*, and is mainly produced by black *koji* fungus. Therefore, it is especially abundant in *awamori* that uses only rice *koji*, cultivated from black *koji* fungus, and water as ingredients.

840 2,4,6-Trichloroanisole



2,4,6-Trichloroanisole (TCA)
CAS 87-40-1, MW 211.5



Detection threshold:
0.0018 µg/L

Associated term(s) : **Moldy**

Characteristics: An aroma reminiscent of mold. A substance responsible for the cork smell of wine.

Origin: Taint. Precursors are generated when chlorine disinfectants and other chemicals are used on wooden utensils in manufacturing facilities, and mold converts them to TCA.

Documents Change History



Document name	Date	Change Details
112 Ethyl caproate	May 22, 2023	Detection threshold 240µg/L → 15 µg/L
411 2-Furanmethanthiol	May 22, 2023	Origin was added