

# beer

flavor standard

## 2,3-butanedione

### ASSESSMENT

Without covering the glass, swirl the beer to release the aroma. Take a single short sniff. Repeat as necessary.

### THRESHOLD

10 – 40 µg/l

### ORIGINS

Produced in beer from a precursor formed by yeast during fermentation. Can also be formed by contaminant lactic acid bacteria.



### CONFUSIONS

- Butyric acid
- Vanillin
- Isobutyraldehyde

### IMPORTANCE

Desirable flavor in some ales, stouts and lagers, eg Pilsner. Off-flavor in other lager beers. Considerable efforts are made by breweries to tightly control this flavor character.

### REMARKS

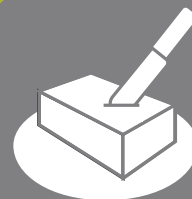
2,3-Butanedione is one of two vicinal diketones found in beer. The ratio of diacetyl to pentanedione concentrations can be used as an indicator of bacterial contamination in beer.

### CAS NUMBER

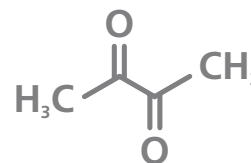
431-03-8



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**Diacetyl**  
"like butter, or  
butter popcorn"



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# beer

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## dimethyl sulfide

### ASSESSMENT

Without covering the glass, swirl the beer to release the aroma. Take a single short sniff. Repeat as necessary.

### THRESHOLD

30 - 50 µg/l

### ORIGINS

Formed from malt-derived precursors, primarily during wort production and – to a lesser extent – during fermentation.



### CONFUSIONS

- Methyl thioacetate
- Ethanethiol
- Dimethyl trisulphide

### IMPORTANCE

Desirable flavor in some pale lager beers and ales. Off-flavor in other beers. Excessive levels are indicative of growth of contaminant bacteria during fermentation.

### REMARKS

The perception of dimethyl sulfide is influenced by the presence of aromatic higher alcohols such as 2-phenylethanol in beer.

### CAS NUMBER

75-18-3



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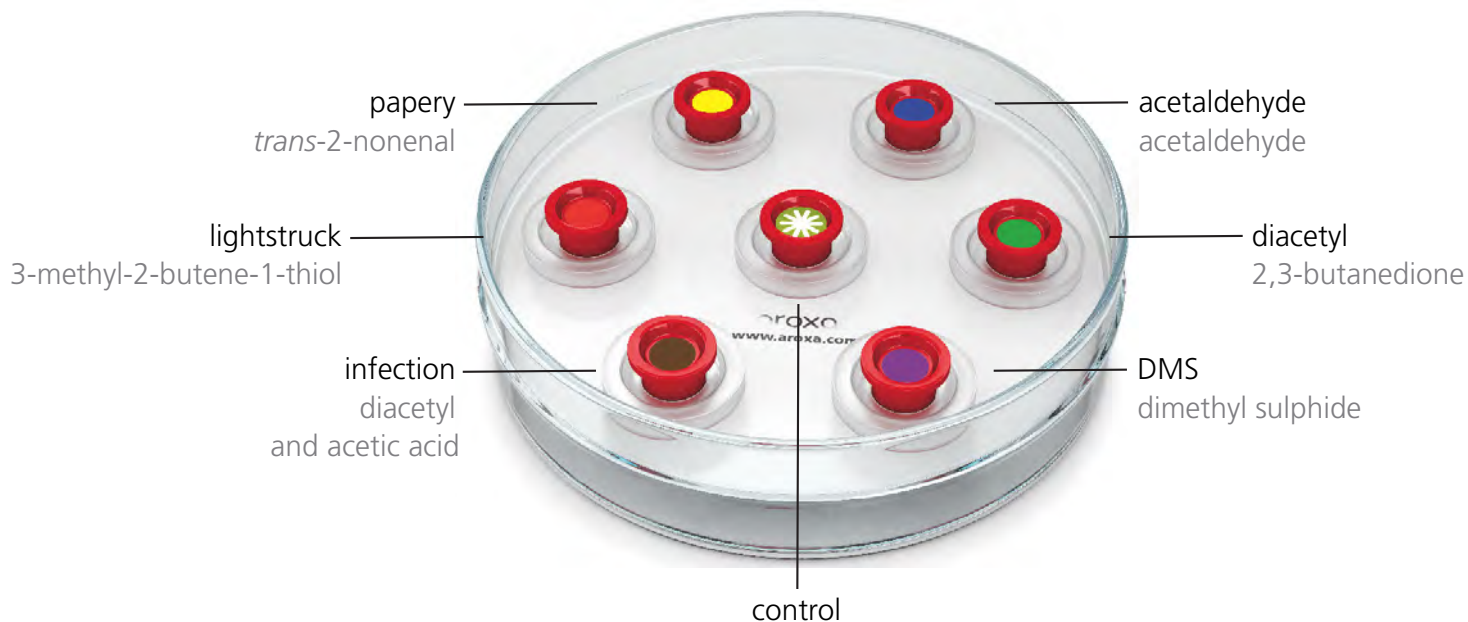
**DMS**  
"like sweetcorn or  
tomato sauce"



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## beer flavor standard acetaldehyde



## Acetaldehyde

"like emulsion paint or green apples"



### ASSESSMENT

Cover the beer with your hand and swirl the glass to release the aroma. Remove your hand and take a single long sniff. Repeat as necessary.

### THRESHOLD

5 mg/l

### ORIGINS

Produced by yeast during fermentation. Indicative of fermentation problems and poor control of dissolved oxygen in packaging.

### CONFUSIONS

- Ethyl hexanoate
- 2,4,6-Trichloroanisole
- *cis*-3-Hexenol

### IMPORTANCE

Present in all beers. Characteristic flavor of some beer styles, eg Bière de Garde. Off-flavor at high concentrations.

### REMARKS

The flavor impact of acetaldehyde is influenced by the sulphur dioxide concentration in the beer.

### CAS NUMBER

75-07-0



# beer

flavor standard

## 3-methyl-2-butene-1-thiol



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### Light-struck

"like a skunk or freshly brewed coffee"

#### ASSESSMENT

Best detected by smelling the beer at a distance. Hold the glass at arm's length and take short sniffs to prevent the risk of adaptation.

#### THRESHOLD

4 – 30 ng/l

#### ORIGINS

Formed as a result of exposure of beer to daylight or artificial light. This initiates a reaction involving hop bitter acids, vitamins and sulphur compounds. Small amounts are also formed in beer production.



#### CONFUSIONS

- Sulphur dioxide
- *cis*-3-Hexenol
- Ethanethiol

#### IMPORTANCE

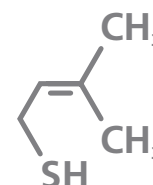
Off-flavor associated with exposure to light of beer packaged in clear or green glass. Consumers are very tolerant of this off-flavor. Many successful beers contain this flavor at the point of consumption.

#### REMARKS

Beers which have been bittered with chemically-modified hop extracts do not develop this character.

#### CAS NUMBER

5287-45-6



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# beer

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## *trans*-2-nonenal



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### Papery

"like cardboard or oxidized beer"

#### ASSESSMENT

Without covering the glass, swirl the beer to release the aroma. Take a single short sniff. Repeat as necessary.

#### THRESHOLD

50 – 250 ng/l

#### ORIGINS

Formed in malt and wort production where it binds to malt proteins. Carried through the brewing process in this bound form. Released during storage of finished beer in pack.



#### CONFUSIONS

- 2,4,6-Trichloroanisole
- 2-Ethyl fenchol
- Isobutyraldehyde

#### IMPORTANCE

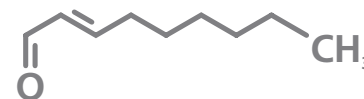
Off-flavor in beer associated with ageing. Formation of this flavor is more pronounced when precautions have not been taken in relation to minimizing process oxidation.

#### REMARKS

Sulphur dioxide in beer reversibly reacts with *trans*-2-nonenal to reduce its flavor impact.

#### CAS NUMBER

18829-56-6



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flavor standard

# infection



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## Infection

“like bile, or  
stomach acid.”

### ASSESSMENT

Without covering the glass, swirl the beer to release the aroma. Take a single short sniff. Repeat as necessary.

### THRESHOLD

Different for each component

### ORIGINS

Improperly cleaned draft lines can harbor bacteria that release several off-flavors into beer.

### CONFUSIONS

- Acetic acid (Vinegar)
- Diacetyl

### IMPORTANCE

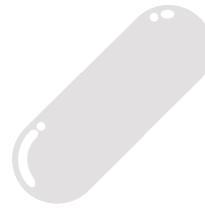
This combination of flavors indicates poor draft system sanitation.

### REMARKS

This standard includes multiple flavors: acetic acid, 2,3-butanedione and citric acid.



**INFECTION:**  
Components are acetic acid, citric acid and 2,3-butanedione



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