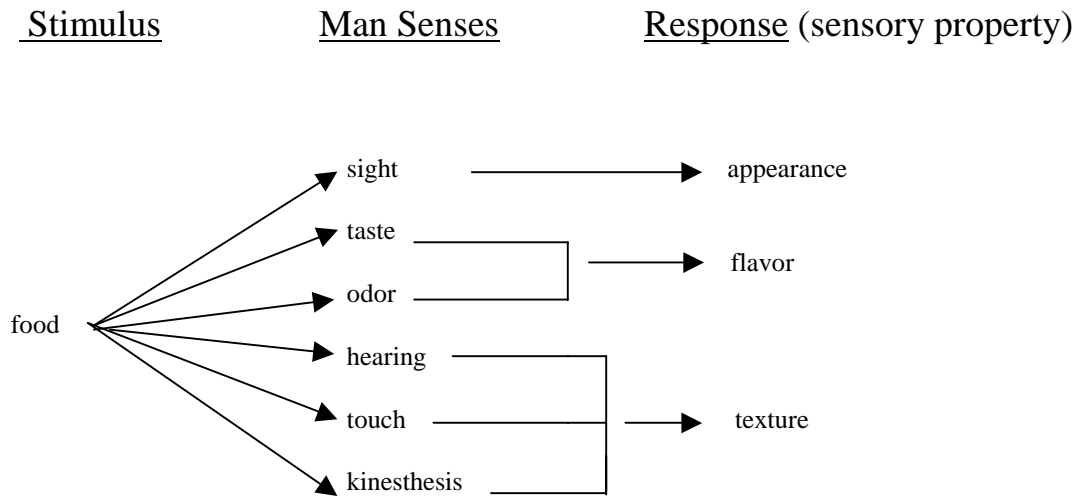


1. INTRODUCTION

I. Definition of Flavor

1. “Flavor is the sensation produced by a material taken in the mouth, perceived principally by the senses of taste and smell, and also by the general pain, tactile, and temperature receptors in the mouth. Flavor also denotes the sum of the characteristics of the material which produces that sensation.”
2. “Flavor is one of the three main sensory properties which are decisive in the selection, acceptance, and ingestion of a food.”



II. Classification of Food Flavors

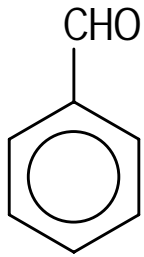
| Flavor Class | Subdivision | Representative Example |
|-------------------|----------------------------------|----------------------------------------------|
| Fruit flavor | citrus-type flavors (terpeny) | grapefruit, orange |
| | berry-type flavors (non-terpeny) | apple, raspberry, banana |
| Vegetable flavors | | lettuce, celery |
| Spice flavors | aromatic | cinnamon, peppermint |
| | lachrymogenic | onion, garlic |
| | hot | pepper, ginger |
| Beverage flavors | unfermented flavors | juices, milk |
| | fermented flavors | wine, beer, tea |
| | compounded flavors | soft drinks |
| Meat flavors | mammal flavors | lean beef |
| | sea food flavors | fish, clams |
| Fat flavors | | olive oil, coconut fat, pork fat, butter fat |
| Cooked flavors | broth | beef bouillon |
| | vegetable | legume, potatoes |
| | fruit | marmalade |
| Processed flavors | smoky flavors | ham |
| | broiled, fried flavors | processed meat products |
| | roasted, toasted, baked flavors | coffee, snack foods, processed cereals |
| Stench flavors | | cheese |

III. Scope of Flavor Chemistry

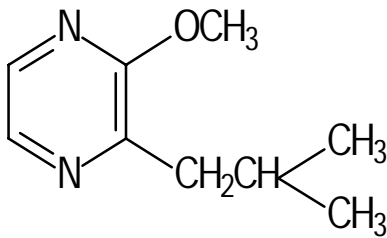
1. Chemical compounds responsible for food flavor

- 1) Even distribution: Brandy
- 2) Star compound: A star compound can not be identical to the total true flavor but is close and can not produce the true flavor without the star compound.

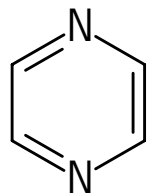
Almond: benzoaldehyde



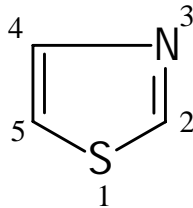
Green pepper: 2-methoxy-3-isobutyl-pyrazine



Both pyrazin and thiazol are important flavor compound groups

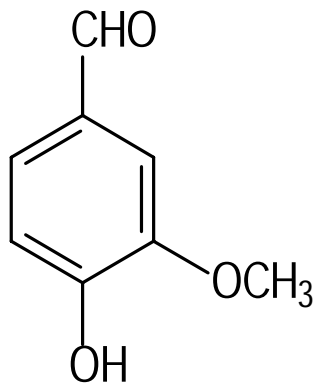


pyrazine

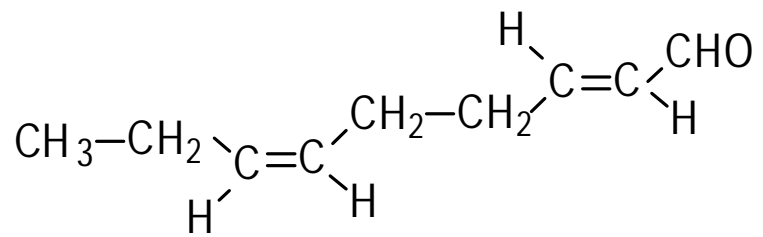


thiazol

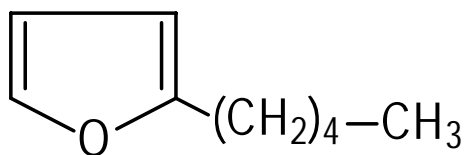
Vanilla: 4-hydroxy-3-methoxy-benzaldehyde



Cucumber: 2-trans-6-cis-nonadienal



Reversion flavor of soybean oil: 2-pentylfuran and 2-pentenylfuran



2. Flavor of foods

- 1) Desirable flavor
 - orange juice
 - potato chip
 - roast beef
- 2) Undesirable flavor (off-flavor)
 - oxidized
 - stale
 - rancid
 - warmed-over

3. Reconstitution of flavor compounds

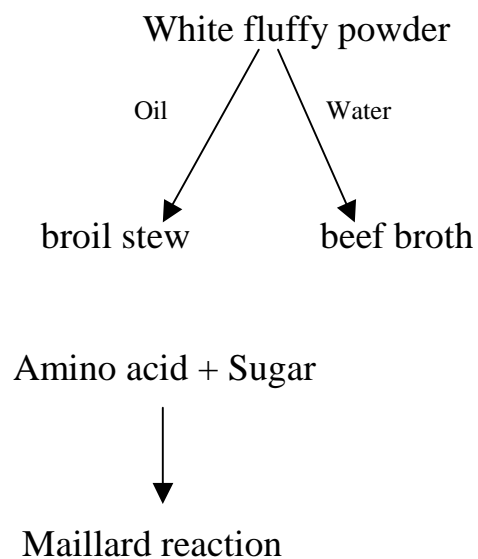
GC \longrightarrow composition

4. Precursors of flavor compounds

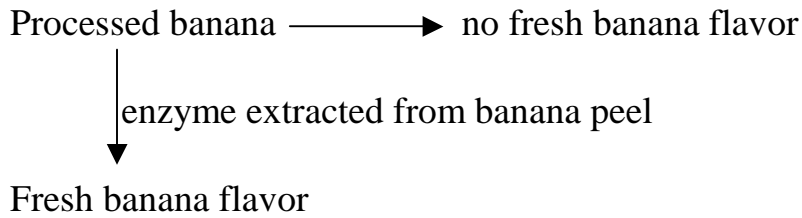
linoleate \longrightarrow 2-pentylfuran

- 1) Non-enzymatic reaction

Precursor of beef flavor can be isolated as a white fluffy powder.



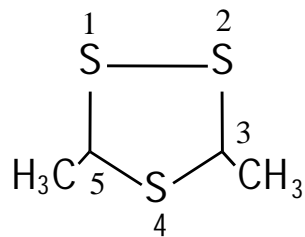
2) Enzymatic reaction



5. Mechanisms for the formation of flavor compounds and precursors in foods

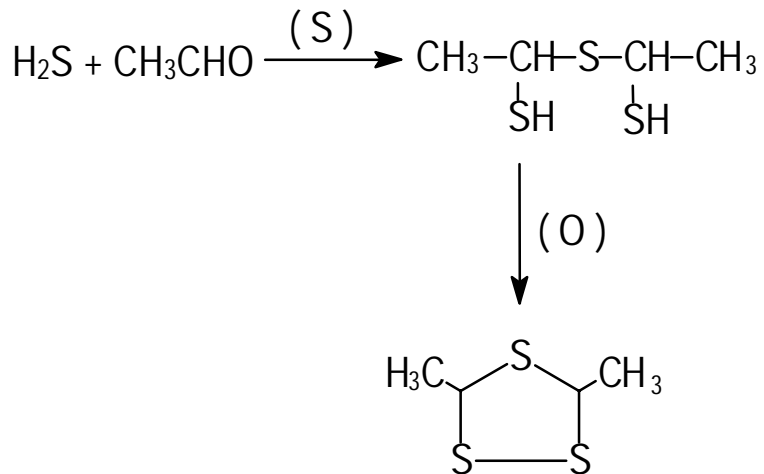
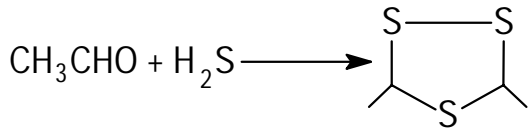
- 1) Volatile flavors developed in most food plants mainly at the ripening stage - the result of plant metabolism through enzymatic reaction.
- 2) Raw meat must be heated before it develops any organoleptically acceptable flavor.

meat flavor (boiled beef)

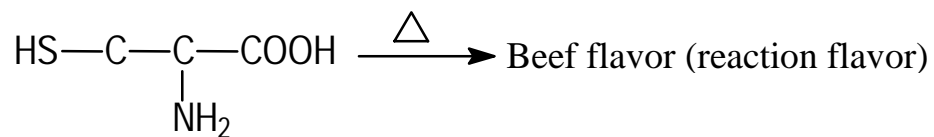


3, 5-dimethyl-1,2,4-trithiolane

Model studies:



Therefore, CH_3CHO , H_2S are precursors



Apply the knowledge we gained from the mechanism and precursor studies to processed food.

- a. Enhance the desirable food flavor.
- b. Elimination of the undesirable food flavor.
- c. Application of heated model system to processed foods.

6. Relationship between physical properties of a compound and its flavor

| | B.P.(⁰ C) 760 mm-Hg | Solubility in H ₂ O g/100 ml | Sense of smell (ppm) |
|------------------------------------|---------------------------------|--------------------------------------------|----------------------|
| n-propanol | 61.0 | 20 | 0.17 |
| n-butanol | 75.7 | 4 | 0.07 |
| n-hexanal | 131.0 | 0.5 | 0.03 |
| acetone | 56.0 | 20 | 500 |
| 2-butanone | 79.6 | 3.7 | 50 |
| CH ₃ -S-CH ₃ | 37.5 | insoluble | 0.012 |

Threshold (ppm)

| | odor |
|-----------------|-------|
| 2-t-pentenal | 2.3 |
| 2-t-hexa(e)nal | 10.0 |
| 2-t-hepta(e)nal | 14.0 |
| 2-t-octenal | 7.0 |
| 2-t-nonenal | 3.2 |
| 2-t-decenal | 33.8 |
| 2-t-undecenal | 150.0 |

The series has an increase b.p. and decreased solubility in H₂O

The vapor compositions of flavor compounds are effected by the medium.
head space analysis

| compound (conc. 200ppm) | aq. System (peak area) | corn oil system (peak area) |
|-------------------------|--------------------------|----------------------------------|
| acetone | 10 | 47 |
| 2-butanone | 14 | 11 |
| 2-pentanone | 22 | 5.7 |
| 2-hexanone | 29 | 2.7 |
| 2-heptanone | 24 | 0.7 |

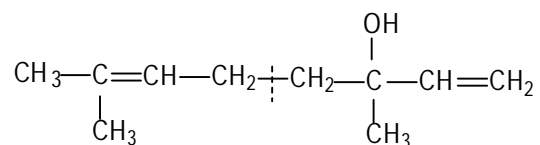
IV. Objectives of Flavor Chemistry

1. To understand the chemical composition of natural flavors and the mechanism of their formation.
2. To retard or prevent the development of the off-flavors in foods.

reversion flavor in soybean oil
hexenal, 2-pentyl furan (they are resulted from polyunsaturated triglycerides, i.e.: linolenate, linoleate)

3. To restore the fresh flavor to a processed food
4. To improve the flavor of food by the addition of synthetic flavor.
5. To produce new foods with special flavor such as potato chip flavor.
6. To improve flavor by the acceleration of reactions which produce desirable flavor compound (onion flavor: pH 5~7).
7. To assist geneticist to breed food raw material with improved flavor compounds or flavor precursors.
8. To specify raw material and to control quality of food products.

The price of tea can be correlated with GLC peak of linalool.



Ceylon tea contains cis-hexenol, India tea doesn't contain cis-hexenol