



## General Objective

The objective of this course is to teach students the role of flavor chemistry in food quality. Chemical structures and formation of flavor compounds, organic, bio, and analytical chemistries involved in flavor research, the effects of processing, packaging and storage conditions on the flavor quality and stability of foods, and current research related to flavor are covered.

Upon completion of this course, students should be able to:

- 1 Understand Chemical reactions involved in flavor compounds formation in natural and processed food.
- 2 Comprehend the effects of food components, processing parameters and storage conditions on flavor quality of foods.
- 3 Understand principles, techniques and applications of analytical instruments involved in flavor analysis.
- 4 Optimize ingredient concentration, processing parameters, packing materials and storage conditions for optimum quality and stability.
- 5 Develop simple research programs of flavor chemistry.
- 6 Specify the flavor qualities of raw ingredients.

## Evaluation

Midterm Examinations (2)	40%
Final Examination	30%
Home Work and Class Participation	30%

# 1. INTRODUCTION

## I. Definition of Flavor

## II. Classification of Food Flavor

## III. Scope of Flavor Chemistry

1. *Chemical compounds responsible for food flavor*
2. *Flavor of foods*
3. *Reconstitution of flavor compounds*
4. *Precursors of the flavor compounds*
5. *Mechanism for the formation of flavor compounds and precursors in foods*
6. *Relationship between physical properties and its flavor*

## IV. Objectives of Flavor Chemistry

# 2. ISOLATION AND SEPARATION OF FLAVOR COMPOUNDS

## I. Objective

## II. Prerequisites

## III. Apparatus for Isolation

1. *Headspace analysis*
2. *Continuous solvent extraction*
3. *Steam distillation and continuous solvent extraction*

## IV. Extraction and Concentration

## V. Preliminary and Final Fractionation

## VI. Dynamic Headspace analyzer

## VII. Solid Phase Microextraction Analysis

# 3. FLAVOR IDENTIFICATION BY SPECTROMETRIC METHODS

## I. Introduction of Spectrometric Analyses

## II. Ultra Violet Spectrometry

## III. Infrared Spectrometry

## IV. Nuclear Magnetic Resonance Spectrometry

## V. Mass Spectrometry

1. *Furans*
2. *Pyrroles*

3. *Thiophenes*
4. *Pyridines*
5. *Pyrazines*

## 4. MANUFACTURE OF FOOD FLAVOR

- I. **Natural or Imitation Flavor**
- II. **Problems of Using Natural Flavor**
- III. **Disadvantages of Using Imitation Flavor**
- IV. **Advantages of Imitation Flavor**
- V. **Methods in Synthetic Flavor Reconstitution**

## 5. CHEMISTRY OF FLAVOR PRECURSORS

### I. **Flavor Compounds from Carbohydrates and Proteins**

1. *Maillard reaction*
2. *Strecker degradation*
3. *Pyrazine formation*
4. *Oxazole formation*
5. *Thiazole formation*

### II. **Thermal Degradation of Vitamin B<sub>1</sub>**

1. *Basic condition*
2. *Acidic condition*
3. *Thiazole compounds*
4. *Furan compounds*

### III. **Lipid Oxidation**

1. *Chemistry of triplet oxygen*
2. *General mechanisms of autoxidation*
3. *Chemistry of singlet oxygen*
4. *Enzymatic lipid oxidation (Lipoxygenase)*

### IV. **Flavor Generated from Enzymatic Method, Microbiological Reaction, and Biogenesis**

1. *Free fatty acids by lipase*
2. *Generation of diacetyl in butter*
3. *Fresh banana flavor*
4. *Onion and garlic flavor*
5. *Tomato flavor*
6. *Asparagusic acid in Asparagus*
7. *Mushroom volatiles*
8. *Flavor formation by Neurospora*

## 6. DAIRY PRODUCTS FLAVOR CHEMISTRY

### I. Milk Flavor

1. *Oxidized flavor*
2. *Rancid flavor*
3. *Heated flavor*
4. *Microbiological flavor*
5. *Absorbed flavor*
6. *Sunlight flavor*

### II. Cheese Flavor

1. *Isolation, separation and identification of cheese flavor*
2. *Biological pathways of fat in cheese flavor*
3. *Reaction products of methionine*
4. *Biochemical pathways of cheese flavor formation from protein*
5. *2-Butanone and 2-Butanol formation from diacetyl and acetone*
6. *Biochemical pathways of cheese flavor formation from lactose*
7. *Lactone formation*
8. *Mechanisms of methyl ketone formation*

## 7. MEAT FLAVOR CHEMISTRY

### I. Effect of Psychrotropic Bacteria on the Volatile Compounds of Raw Beef

1. *Introduction*
2. *Effects of light and dark storage on the volatile compounds of aseptic raw ground beef*
3. *Effects of psychrotropic bacteria on the volatile compounds of aseptic raw ground beef*

### II. Isolation, Separation, and Identification of Roast Beef Flavor

### III. Simulated Meat Flavor Formation

## 8. ORANGE FLAVOR STUDY BY PULSED ELECTRIC FIELD PROCESS

## **9. INTERACTION OF FLAVOR COMPOUNDS WITH FOODS**

- I. Physical and Chemical Stability of Flavor**
- II. Effects and Interactions of Lipids with Flavor Compounds**
- III. Effects and Interactions of Carbohydrates with Flavor Compounds**
- IV. Effects and Interactions of Proteins with Flavor Compounds**

## **10. PACKAGING AND FLAVOR COMPOUNDS INTERACTION**

- I. Effects of Packaging Materials on the Flavor Quality of Food**
- II. Sorption of Orange Flavor Compounds by Packaging Materials**

## **11. FLAVOR COMPOUNDS AND SOLVENT INTERACTION**

- I. Commercial Cherry Flavor and Solvent Interaction**
- II. Acetal Formation**

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