

# **STEM in Food Science in Technology and Living**

## **Molecular Gastronomy**

# Molecular Gastronomy

- A subdiscipline of food science to:
  - investigate the physical and chemical transformation of ingredients that occur in cooking
  - apply scientific principles to produce new flavours and textures

Reference: [https://en.wikipedia.org/wiki/Molecular\\_gastronomy](https://en.wikipedia.org/wiki/Molecular_gastronomy)

# Some Techniques Used in Molecular Gastronomy

1. Transforming a liquid into a solid by hydrocolloids
2. Dehydration of oil by maltodextrin
3. Spherification
4. Sous-Vide
5. Flash Frozen by liquid nitrogen
6. Edible paper by potato starch and soy lecithin
7. Foams by food stabilizers and thickening agents

Source: <https://www.organicauthority.com/buzz-news/molecular-gastronomy-techniques-explained>

# Transforming a liquid into a solid by hydrocolloids

- Hydrocolloids, often called gums are:
  - hydrophilic polymers of vegetable, animal, microbial or synthetic origin, that generally contain many hydroxyl groups and may be polyelectrolytes
  - naturally present or added to control the functional properties of aqueous foodstuffs
- Properties of hydrocolloids, such as:
  - solubility, viscosity (including thickening and gelling), water binding etc.
- Examples of hydrocolloids:
  - carrageenans, alginate, agar, gelatine, pectin and starch

# Transforming a liquid into a solid by hydrocolloids

## Carrageenans

- Linear polymers of about 25,000 galactose derivatives.
- Can be prepared by alkaline extraction from red seaweed.
- Different seaweeds produce different carrageenans.
- Their functions are mainly thickening, suspending and gelling, such as:
  - to stabilise milk products by preventing whey separation
  - as a binder in cooked meats to firm sausages
  - as a thickener in toothpastes and puddings

# Dehydration of oil by maltodextrin

## Maltodextrin

- A polysaccharide that is used as a food additive
- Produced from starch by partial hydrolysis
- Very light-weight white hygroscopic powder that is very porous on the microscopic level
- Able to soak up fatty substances to transform the fat into a powder like substance (a dehydrated illusion)
- Can be easily dissolved in water with a mildly sweet taste, mimics the viscosity and texture of fats and used in food products as:
  - an emulsifier and a thickener
  - a fat substitute

# Spherification

- Spherification is a process to turn liquid food such as coffee into little balls that visually and texturally resemble roes
- A chemical reaction between alginate and calcium is taken place to transform the physical properties of the liquid food. A water-insoluble, gelatinous, cream-coloured membrane (calcium alginate) is formed surrounding the balls
- There are two main methods:
  - basic spherification (adding sodium alginate droplets into calcium bath, the membrane is set and the balls are formed)
  - reverse spherification (adding calcium chloride / lactate droplets into sodium alginate bath, the membrane coats the droplets and the balls are formed)

# Spherification

## Alginates

- Refined from brown seaweeds
- Absorbs water quickly
- It has a wide use across a wide variety of industries including food, textile printing and pharmaceutical
- In the food industry, it is used as a thickening agent for drinks and ice cream, and as a gelling agent for jellies



# Related Food Tests

| Food Test Number | Food Test                     |
|------------------|-------------------------------|
| Food Test 15     | Making of soya milk spaghetti |
| Food Test 16     | Making of olive oil powder    |
| Food Test 17     | Making of coffee caviar       |

# Related Teaching Materials

| File               | Teaching Materials          |
|--------------------|-----------------------------|
| Sensory evaluation | Sensory evaluation          |
| Sensory evaluation | Sensory evaluation template |