# Molecular Gastronomy and Cooking 分子與料理

## Introduction簡介

Have you ever been curious about what happens during rice cooking or meat grilling? The subject of Molecular Gastronomy can help answer your questions. As a scientific discipline, molecular gastronomy is about studying and investigating the physics and chemistry behind cooking. Thanks to Hervé This, a physical chemist, and Nicholas Kurti, a former professor of physics at the University of Oxford, who first introduced molecular gastronomy in 1988, many traditional cooking techniques were investigated. Nowadays, many new culinary styles like molecular cuisines are created based on such techniques and their scientific principles.

There are numerous molecular cooking techniques such as emulsification, spherification, sous vide and flash freezing, but for now, we will focus on spherification. Spherification is a technique used for transforming a liquid into a solid sphere resembling salmon roe.

For basic spherification, sodium alginate and calcium lactate are two common reagents used. These two salts can react with each other via an ion-exchange reaction to form a thin membrane, which is flexible and water-insoluble. The membrane formed will encapsulate the liquid and form a salmon roe-like sphere. Indeed, this technique has been popularly used in French restaurants.

你對於煮食和料理感到好奇嗎？若是，分子料理能滿足你的好奇心。這是一門用科學原理和知識去解構煮食和料理的學問。在1988年，由物理化學家Hervé This，和物理學教授Nicholas Kurti共同提出。他們從科學角度解構不同的傳統煮食技巧，從而得出不少有用的煮食科學結論。時至今天，不少新穎的料理技巧如分子料理都是基於他們當年的科學推測和結論，影響深遠。

近年備受歡迎的分子料理，其實包含了各種各樣的技巧。例如乳化、晶球化、慢煮和冷凍煮食等等。在今次的工作坊，我們會嘗試的是晶球化。這是一種可令液體變成晶球的方法，既簡單又易學。

在學習晶球化的過程中，我們會用到兩種很常用的材料，分別是海藻酸鈉和乳酸鈣。這兩種材料一起能產生離子互換的化學作用，從而生成出既有彈力但又不溶於水的薄膜。這層薄膜能鎖住液體，製造出類似於三文魚子的晶球。這種技巧於法國料理中最為常見。

## Objectives主旨

**For junior secondary students:**

**以初中學生為對象：**

* 1. To understand what is molecular gastronomy  
     認識煮食和料理的科學
  2. To recognize the techniques commonly used in molecular cooking   
     認識不同的分子料理技巧

**For senior secondary students:  
以高中學生為對象：**

1. To understand what is molecular gastronomy  
   認識煮食和料理的科學
2. To explain some physical and chemical changes in food during cooking

解釋在煮食過程中食物發生的物理和化學變化

1. To recognize the techniques commonly used in molecular cooking  
   認識不同的分子料理技巧

## Materials材料

1. Plastic bottle containing 0.2 g of sodium alginate

膠樽連0.2克海藻酸鈉

1. 1.25 g of calcium lactate

1.25克乳酸鈣

1. 1 filter paper

1張濾紙

1. 1 transparent cup

1個透明杯

1. 1 paper cup

1個紙杯

1. 2 stirring sticks

2支攪拌棍

1. 1 dropper

1支滴管

1. 1 small paper cup

1個小紙杯



## Methods方法

* 1. Fill the plastic bottle with 20 mL of your favourite beverage.

把20毫升的飲料倒入帶有海藻酸鈉的膠樽內。

* 1. Shake the bottle vigorously for 1 minute until most of the sodium alginate is dissolved.

把飲料和海藻酸鈉搖晃約一分鐘，直至大部分海藻酸鈉溶解。

* 1. Let the bottle sit for 15 minutes to allow any air trapped bubbles to escape.

讓溶液靜止約15分鐘，釋放多餘的空氣氣泡。

* 1. Add 1.25 g of calcium lactate into the transparent cup.

把1.25克的乳酸鈣加進透明小杯。

* 1. Fill the cup containing calcium lactate with 200 mL of drinking water.

把200毫升的飲用水加進帶有乳酸鈣的透明小杯內。

* 1. Using the stirring stick, stir the solution for 1 minute until most of the calcium lactate is dissolved.

利用攪拌棍攪拌，把大部分的乳酸鈣溶解。

* 1. Add the beverage containing sodium alginate dropwise (1 drop per second) to the calcium lactate solution by using the dropper provided. When adding the droplets, hold the dropper horizontally and from a height of about 1 inch.

利用滴管，把含有海藻酸鈉的飲料，每秒一滴，滴進乳酸鈣溶液。請確保在高於溶液面約一寸的位置，垂直地用滴管把飲料滴進乳酸鈣溶液。

* 1. After 30 seconds, filter the “salmon-roe” by using a filter paper.

30秒後，用濾紙把晶球從溶液裡過濾出來。

* 1. Collect the “salmon-roe” and place it on a plate.

最後，把水晶球體從濾紙拿出來即可。

## Risk Assessment / Control 風險評估 / 控制

* 1. After the experiment, make sure to wash your hands thoroughly using detergent.  
     實驗完結後，請用洗手液徹底清潔雙手。
  2. Although all the reagents used are safe for human health, it is not recommended to taste the molecular cuisines.

雖然使用的材料對身體無害，但不建議食用。

* 1. Please dispose of all the used materials into a normal trash container as usual.

請把用完或多餘的材料倒進普通垃圾桶即可。