



# Chemistry and Industry for Teachers in European Schools

## **CHEMISTRY CHANGES EVERYTHING**

Food Flavourings - Pringles

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Original document in English



Education and Culture

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CITIES (*Chemistry and Industry for Teachers in European Schools*) is a COMENIUS project that produces educational materials to help teachers to make their chemistry lessons more appealing by seeing the subject in the context of the chemical industry and their daily lives.

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- Czech Chemical Society, Prague, Czech Republic, <http://www.csch.cz/>
- Jagiellonian University, Kraków, Poland, [http://www.chemia.uj.edu.pl/index\\_en.html](http://www.chemia.uj.edu.pl/index_en.html)
- Hochschule Fresenius, Idstein, Germany, <http://www.fh-fresenius.de>
- European Chemical Employers Group (ECEG), Brussels, Belgium, <http://www.eceg.org>
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**This project has been funded with support from the European Commission. The present publication reflects the views only of the author/s, and the Commission cannot be held responsible for any use which may be made of the information contained therein. The CITIES team advises that everybody using the experimental material of CITIES is familiar and does comply with the appropriate safety rules that are part of a proper professional conduct and of the respective national and institutional regulations. CITIES cannot be held responsible for any damage resulting from inappropriate use of the procedures.**



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## FOOD FLAVOURINGS - PRINGLES

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# A Chemical Cocktail?

### Introduction

'Pringles' are a specialized form of potato chip. Quite simply, a potato chip is a thin slice of potato which has been fried in either oil or fat. This may seem a strange topic in a chemistry article, but please read on – you will see where we're heading.....

### When did this all begin?

Potato chips have been around for quite a long time. George Crum is credited with having introduced potato chips in 1853, although references can be found as to their existence some thirty years earlier. Potato chips were sold in grocery stores in the USA from the end of the nineteenth century, but only as plain (unflavoured) chips. In 1920, crisps (as they are known in the UK) were sold with a small bag of salt inside the crisp bag. This gave the purchaser the option of adding the salt or eating the crisps without additional flavouring. Eventually, crisps were sold with the salt already added. Other flavourings were made available from the 1950s onwards.

Alexander Liepa, who is credited with the patent for the "invention" of 'Pringles' must not have known what he had started when he unveiled the 'Pringle's Newfangled Potato Chips' in October 1968. Originally, these were salted, but, as with their predecessors, other flavourings quickly became available.

### Why are 'Pringles' different?

Ordinary potato chips have their shape determined by that of the potato from which they are cut; 'Pringles' are all the same size and shape. They owe this to a unique machine invented by a science-fiction writer, Gene Wolfe. As a consequence of their identical size and shape, they fit snugly together inside the tube they are contained within. Other chips are usually sold loosely in bags.

## So, where's the Chemistry?



Well, the answer to this question lies in the flavourings used in 'Pringles' production.

In their simplest form, potato chips rely exclusively on the natural flavour of the fried potato. Even this could be expanded to discussing the chemical changes which take place within the food when vegetable matter is heated. If we're going to be strictly accurate, we could talk about the vegetable oils used to fry the slices of potato, but this would not be as interesting as talking about the artificial flavourings used in 'Pringles'

The simplest additive, salt, is of course a chemical substance. Better known to the chemist as sodium chloride (NaCl), this substance has been used to enhance the taste of food for thousands of years.



But, what else is used to produce flavour?

Now that there are several different varieties of 'Pringles' on the market, the need for additional flavourings has increased. Here is a list of some of the more commonly used substances:

Maltodextrin,  
 Dextrose,  
 Potassium chloride,  
 Citric acid,  
 Lactic acid,  
 Malic acid,  
 Vinegar,  
 Sodium diacetate  
 Monosodium glutamate\* (MSG), also known in Europe as E 621  
 Disodium-5'-ribonucleotide\* also known in Europe as E 635  
 Mono and di-glycerides also known in Europe as E 471

Plus numerous other of the more traditional flavourings, such as mustard, paprika, onion, garlic, sesame etc

\* these substances are called "flavour enhancers"

It was recognized by US soldiers during the Second World War that captured Japanese army food rations were much tastier than their own. This was eventually explained by the relatively simple discovery that MSG was used in their preparation.

## So, do you want to try something for yourself?



You can make your own potato chips very easily. All you need is a potato and a pan of cooking oil!

- Wash a medium-sized potato. You do not have to remove the outer skin if you do not want to. Slice the potato into thin pieces, about 2 mm thick – a food grater is ideal for this.
- Remove as much water from the pieces of potato by folding them inside paper kitchen towel.
- With great care, heat some cooking oil (e.g. sunflower oil) to about 180-200° C and add the potato slices. Cook until browned. This does not take very long.
- Eat with a sprinkling of salt or other flavouring of your choice. You could try mayonnaise, ketchup, chilli dip etc

An even simpler method is to cook the potato pieces without frying. Instead, place the dried slices of potato on a microwave-proof plate. Try to avoid overlapping the potato pieces. Cook on full power until the slices start to brown. As before, this does not take long.



## How are these chemicals produced?

The manufacture of food additives is a major part of the chemical industry. Numerous different chemicals are made in all parts of the world. Some substances are extracted from natural sources, such as plant or animal origins. Others are synthetic copies of these natural substances. A third variety of food additive is the type which does not exist naturally, such as MSG. The enormity of the list of additives used prohibits details of their manufacture from being given. However, the interested reader can easily find references to the manufacture of any one specific material.

## What are the benefits?

Clearly, if we restrict our interest solely to the case of 'Pringles' the benefits are very limited indeed. However, the foodstuffs industry would be very much the poorer without food additives, especially flavourings. Possible advantages are:

- Improvement of the taste of low-quality food, particularly relevant in third-world countries
- Improving the flavour of unpleasant-tasting substances, such as medicines
- Diversification of what would otherwise be termed "bland" foods
- Widespread availability of flavourings which would otherwise be either very rare or very expensive in their natural form

## Are there any known risks?

Food additives are rigorously tested before being released for use. This does not mean, however, that they are not without risks. When ingested in small quantities, the risk to human life is minimal, but if large quantities are taken there could be problems.



There have been suggestions that increased numbers of migraine attacks have been suffered amongst persons who have eaten food containing monosodium glutamate the so-called "Chinese restaurant syndrome". This is based on the fact that MSG is extensively used in the preparation of food in such establishments.

There does not appear to be any scientific evidence to support this theory.

It has been well-known for many years that a high intake of sodium in the human diet contributes to hypertension, or high blood-pressure.

There have been reports of skin rash irritation by some users of food additives.

## Future developments?

There will always be openings for the development of new flavours. The promotion of foodstuffs, especially snack-foods is particularly reliant on the search for new flavours to increase a given company's share of a particular market sector. The increasingly discerning consumer will always look for innovation.

In the UK, the potato crisp manufacturer **WALKERS** have recently introduced a new range of flavourings. At the time of writing, these include:

"Builder's breakfast" (bacon, sausage, beans and egg)  
Onion Bhaji  
Fish and chips  
Chilli and chocolate  
Crispy duck and hoisin  
Cajun squirrel  
Chilli and lemon





Plus the usual range of old favourites: smoky bacon, steak and onion, bbq rib, Worcester sauce, prawn cocktail, cheese and onion .....

Who knows where this will end?

Having seen how chemistry is used to produce flavourings for Pringles and other potato crisps, it should not surprise one to find that chemistry is used in almost all other forms of processed foods.

### **Intrigued by what you have read?**

If so, there is a wealth of material you can access for further information. Some useful referentes are listed below:

[www.pringles.com](http://www.pringles.com)

<http://www.walkers-crisps.co.uk/>

[http://en.wikipedia.org/wiki/Potato\\_chip](http://en.wikipedia.org/wiki/Potato_chip)

[www.answers.com/topic/artificial-foods](http://www.answers.com/topic/artificial-foods)

[www.chem-tox.com/pregnancy/artificial.htm](http://www.chem-tox.com/pregnancy/artificial.htm)

[http://www.pringles-info.co.uk/en\\_GB/range\\_select.aspx?flav=pap](http://www.pringles-info.co.uk/en_GB/range_select.aspx?flav=pap)