cuisineinnovation
Science et technologie au service de la création culinaire

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Sodium alginate (E401)

Culinary data

Sodium alginate, used preferably at a rate of 1g for 100g of final preparation or less, is a thickener with neutral taste. In the presence of calcium ions, sodium alginate is a gelling agent.
It enables:

- the thickening of a sauce usually obtained by addition
- of egg, fat or flour,
- the suspension of herbs or spices,
- the preparation of beads gelled on the outside and liquid inside. There are two techniques: “spherification” (alginate in the liquid to be “spherified”) or “reverse spherification” (alginate in the bath).

Technological data

Dissolution

Sodium alginate is soluble in water or juices, if:

- the content in calcium ions is low enough not to form a gel,
- the pH is greater than 3.

To obtain an efficient dissolution, the individual particles of sodium alginate have to be well dispersed and should not remain in contact as they enter the water. This can be obtained by:

- sprinkling the sodium alginate powder into a vigorously stirred solution.
- dry mixing the sodium alginate into another solid ingredient of the recipe, like sugar, before addition to water.

For practical reasons, care should be taken not to incorporate too much air, since the bubble once formed take long time to disappear, as a consequence of the increased viscosity. Sodium alginate is soluble in mixture of water with up to 20% ethanol or 70% of glycerol. It is used preferably at a dose comprised between 0.5 and 1g for 100g of final preparation.

Gel setting

Spherification and reverse spherification are taking place when a calcium rich fluid and sodium alginate containing fluid are set into contact. The calcium ions diffuse from the calcium rich fluid to these containing little or no calcium. The gel is forming thus initially at the “frontier” between the two fluids, creating a gelled film. The thickness of this film depends on the time left before rinsing.
For the spherification, the calcium source is calcium lactate or calcium gluconolactate.
Practically, a content of 1g of calcium salt for 100mL of calcium bath is used. For the reverse spherification, the calcium source can be the food to be “spherified” itself, as in the case of naturally rich in calcium dairy products, or preparation to which a calcium salt can be added.

Sensory characteristics

Le gel est neutre en goût.

Keeping

The beads formed by spherification have to be served right after their fabrication to conserve their inside liquid.
On contrary, the beads formed by reverse spherification can be prepared in advance, providing they are kept in an aqueous medium.

Storage

maximal temperature 25°C
air moisture < 60%.

Toxicological data

- No acceptable daily intake level.
- No known side effects in the concentrations used to obtain the desired effect.
- May cause flatulence at high doses.

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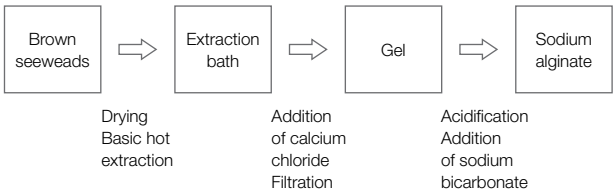
Scientific data

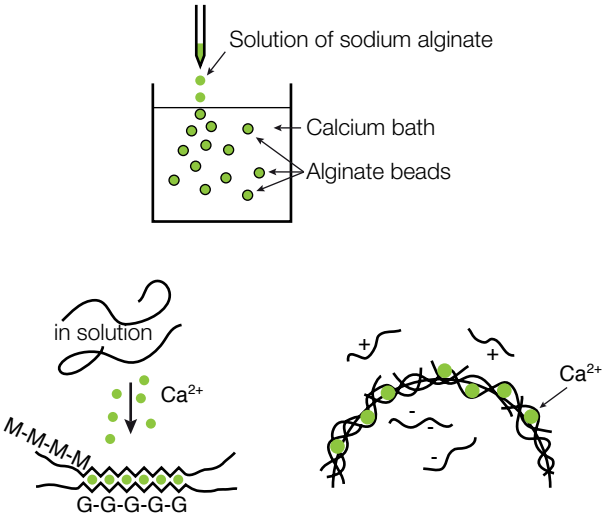
Origin

The alginates are a family of polymers extracted from brown seaweeds (classe des *Phaeophyceae*).The brown seaweeds' genus frequently used for alginates' extraction are *Laminaria hyperborea*, *Macrocystis pyrifera*, *Ascophyllum nodosum*. Their preparation for an alimentary use include a control of the ions they contain. In the natural environment, alginates exist with a mixture of ions of types Na^+, K^+, $Ca2^+$.



Chemical composition

Sodium alginate is a polymer (long molecules made by attaching one after the other a large number from one or several small molecules) made of two carbohydrates: M and G on the scheme above (i.e. sugars in chemistry's words, with a meaning not restricted to table sugar). This polymer comes along with sodium ions. When calcium ions are added, the polymers wrap around them to form a gel.



Mechanism of gel formation trough the interaction between calcium ions and sodium alginate.

History

Sodium alginate has been discovered in 1881 by an English chemist named E. C. C. Stanford. Its commercial exploitation started only in the 1930s.

Informations from Sime W. J. in *Food Gels* (ed. P. Harris), Elsevier **1990**, 53-78

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