



Melty cheese with sodium citrate

Background

Cheese is an emulsion, with particles of fat surrounded by water and held together with proteins that act as emulsifiers. The proteins form a mesh throughout the cheese, bound together with the help of calcium. As cheese is warmed up and melts, the fat liquifies and the proteins become less tightly associated causing a stretchy, gloopy consistency. In good melting cheeses, the water in the cheese stays mingled with the fat but many aged cheeses separate into lumpy, chewy blobs of protein sitting in liquid fat. Much of their water content evaporated as they aged, increasing the relative fat content and concentrating the flavour. In addition, the protein in aged cheese becomes tightly clumped and less likely to come apart when heated. This has two effects: i) with less water around, the fat is more likely to break out of emulsion and congeal when melted; ii) the fat is also no longer contained by the protein mesh.

James L. Kraft, who in 1916 patented the first American cheese slice, came up with a solution. He discovered that sodium phosphate keeps the water and fat droplets mixed when the cheese is melted. Sodium makes the cheese less acidic and stabilises the emulsion by replacing some of the calcium ions that tightly binds the proteins, specifically casein, with sodium. This changes their structure and exposes both hydrophilic (water-loving) and hydrophobic (oil-loving) ends allowing them to separate and act as emulsifiers again. Sodium citrate has the same effect and is now a common ingredient in 'constructed cheese' in modernist cuisine: aged cheese whose melting is facilitated by addition of the salt giving the texture of smooth processed cheese but the complex and intense flavor of the original cheese.

There are three types of sodium citrate: monosodium citrate, disodium citrate, and trisodium. Most sodium citrate used for food is the trisodium form. Sodium is the weak conjugate base of citric acid. If you remove the H⁺ portion of citric acid and replace it with Na⁺ ions, you get sodium citrate.

Ingredients

- 100 g grated cheese
- 50 g milk or water
- 3 g sodium citrate

Preparation

1. Combine 50 g milk or water and 3 g sodium citrate in a pot, stir until dissolved, and then bring to a simmer over medium heat OR allow to melt slowly in a slow cooker.
2. Gradually add shredded cheeses to the simmering liquid. Blend in each addition until it has melted and is completely smooth.
3. Serve for dipping, you can also allow it to cool and solidify and shape or slice.

Recipe ideas

- [Silky Smooth Macaroni and Cheese](#)
- [Melly queso dip](#)