



## Calcium in Cheese

### Description

Cheese comes in many varieties and is made from milk of various animals, including cows, sheep, goats and horses. The variety determines the ingredients, processing, and characteristics of the cheese. As milk sours, it breaks down into curds, lumps of phosphoprotein, and whey. It is the curds that are used to make cheese. Cheese can be broadly categorized as acid or rennet cheese and natural or process cheese. Acid cheeses are made by adding acid to the milk that causes the proteins to coagulate.

Cheese is one of the most nutrient rich foods containing proteins, fats, salts, calcium, magnesium and phosphates. Other than supplying nutrition, these components play a major role in the formation of cheese. For instance, salts, calcium and phosphate have an important role in the rennet coagulation of milk and in the structure and buffering of cheese.

Calcium concentration has a major impact on the final properties of the cheese. The concentration of calcium in cheese affects the aggregation of renneted casein micelles; this is a major factor in determining the softening, melting and flow characteristics of cheese. Additionally, calcium content affects the buffering capacity of cheese. As calcium content decreases, the pH of the cheese increases. Calcium also affects the protein level and moisture content in cheese. As calcium content decreases, protein level decreases and moisture content increases, and thus eventually the fluidity increases. For these reasons, calcium is a commonly measured parameter throughout the cheese making process.

### Application

A local lab set up for analysis of dairy products contacted Hanna Instruments looking for a way to analyze the calcium content in cheese potentiometrically. The customer wanted to comply with the International Dairy Federation method for the titrimetric analysis of calcium in milk. In accordance with this method, Hanna Instruments suggested the **HI902** Potentiometric Titrator and **HI4104** Combination Calcium ISE. Samples were prepared by taking a known weight of the cheese sample, finely grinding it and then heating it with distilled water and concentrated sulfuric acid for a set amount of time. The solution was then neutralized using sodium hydroxide, buffered with an ammonium chloride-ammonium hydroxide buffer, and titrated with EDTA.

The customer was quite pleased with the versatility of the HI902, which could also measure the pH of various dairy samples bought to their lab as well as automate their TA titrations, which they were previously doing by hand. The ability of the HI902 to support two electrodes, two pumps, and two boards made for easy automation of both calcium and TA measurements. The customer also inquired about in the future, adding a method for measuring protein in their cheese via the TKN titration method. They were impressed with the knowledge of the Hanna Technical Sales Representative and Applications Engineer that were onsite during their installation. The Hanna Team was able to provide the customer an overview of the TKN procedure, as well as a

list of the required materials for the necessary digestion.

Since the HI902 performs all calculations and prepares the graph simultaneously during the titration, the customer saved a lot of time and eventually the number of samples analyzed per day increased. They were quite pleased that a printer could be directly attached to the titrator, which saved them from transferring files to PC and then taking printouts to be further given to their customers. The HI902 offered the customer a comprehensive testing solution for their dairy sample analyses.

