Cheese is a gastronomic icon in many countries such as Switzerland, Italy, and of course, France, where Charles de Gaulle once quipped, “How can you govern a country in which there are 246 kinds of cheese?” The production of many cheeses relies on rennet, a natural enzymatic mixture that coagulates milk. But monitoring rennet activity can be difficult. In a recent Analytical Chemistry paper (DOI 10.1021/ac1017925), Maminatos Prodromidis and colleagues at the University of Ioannina (Greece) describe a sensor based on electrochemical impedance spectroscopy (EIS) that uses a different approach to analyze rennet.

Milk is a colloidal suspension. The colloids, called micelles, are festooned on the surface with a κ-casein protein layer, the top of which looks like wild, curly hair. The micelles are negatively charged, and repulsive forces keep them in suspension. Rennet contains the protease chymosin, which chews off κ-casein in the artificial casein micelles, allowing a redox probe in bulk solution to access the electrode surface, using an enzymatically-driven reaction to alter the properties of the sensing surface.” Heinz-Bernhard Kraatz at the University of Western Ontario (Canada) says the work’s “novelty lies in the complexity of attaching micelles to a surface and using an enzymatically-driven reaction to alter the properties of the sensing surface.”

The investigators tested the sensor on various commercial powdered or liquid rennet samples and measured values that matched those calculated with a reference method. They observed reliable signal changes within 5 min of incubation, suggesting that the sensor would be useful in routine analysis.

The investigators are now busy further developing the sensor. “So far, experiments have been conducted in the lab in combination with a bench-type electrochemical analyzer,” says Prodromidis. “However, in combination with portable instrumentation, the sensors in their current form—or even better, as flat, interdigitated electrodes—can be used as disposable sensors for on-site measurements.”

—Rajendrani Mukhopadhyay