



HAL
open science

COAGU’CAPT : SENSOR IN VAT FOR MONITORING REAL-TIME MILK COAGULATION

Philippe Trossat, Vincent Humblot, Thérèse Leblois, Jean-François Manceau,
Benoît Paysant, Eric Beuvier, Richard Revy

► **To cite this version:**

Philippe Trossat, Vincent Humblot, Thérèse Leblois, Jean-François Manceau, Benoît Paysant, et al..
COAGU’CAPT : SENSOR IN VAT FOR MONITORING REAL-TIME MILK COAGULATION. IDF
World Dairy Summit, Oct 2024, Paris, France. hal-04893197

HAL Id: hal-04893197

<https://hal.science/hal-04893197v1>

Submitted on 17 Jan 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

COAGU'CAPT : SENSOR IN VAT FOR MONITORING REAL-TIME MILK COAGULATION

AUTHORS:

Philippe TROSSAT¹, Vincent HUMBLLOT², Thérèse LEBLOIS², Jean-François MANCEAU², Benoit PAYSANT¹, Eric BEUVIER³, Richard REVY⁴.

¹ACTALIA, Poligny, France; ²FEMTO-ST, Besançon, France; ³UMR PAM, Poligny France; ⁴ENILEA, Poligny, France.

INTRODUCTION:

This COAGUCAPT project, supported by the CNIEL, Région BFC and BPI, concerns the development of a milk coagulation sensor, in situ, immersed into the vat. The sensor will allow a precise evaluation of the milk clotting time (transition from a liquid state to a gel state), of the speed of the gel formation and the state of curd firmness, for an appropriate cutting time.

The outcome for the cheesemaker is to obtain the most stable production quality over time and to increase manufacturing yield.

METHODS:

The technology concerns the development of a milk coagulation sensor, and its on-board electronics (Figure 1) based on a principle of generating a localized, non-propagating acoustic wave.



Figure 1 : COAGU'CAPT acquisition system

This wave is generated by a piezoelectric transducer glued to a stainless steel membrane (Figure 2). The rigidity of the gel during coagulation (curdled milk) induces mechanical damping on the membrane enabling the electrical properties of the piezoelectric transducer to be measured and the rigidity parameters of the gel to be extracted.

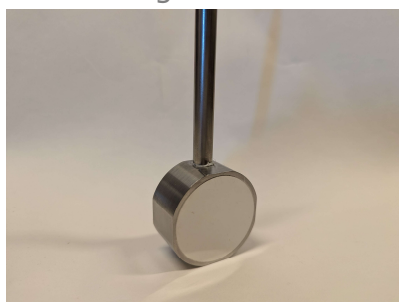


Figure 2 : Frontside to the COAGU'CAPT sensor

RESULTS:

After the introduction of the coagulant, the frequency shifts providing access to different parameters (Figure 3), for example:

- clotting time (CT)
- gel firmness after one clotting time (GF)

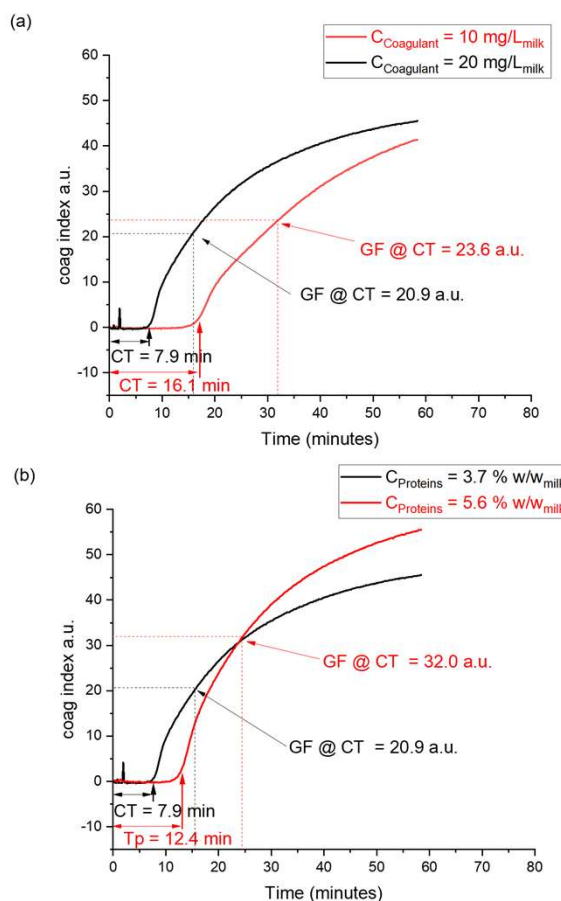


Figure 3 : Sensitivity of the COAGU'CAPT sensor to the amount of rennet (a) and the amount of proteins (b).

CONCLUSION:

The sensor will be validated at different scales: in the laboratory, pilot cheese-making plant and cheese industry (reproducibility, sensitivity, influence of technological conditions, comparison with existing at line sensors).

A real-time processing of the data will allow the prediction of the different parameters of interest for the cheesemakers.