CO2 kinetics in cheese matrix at 20°C position from interface (mm) A new methodology to monitor CO2 transfer and determine its diffusivity and solubility in solid food
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To cite this version:
Estelle Chaix, Valérie Guillard. CO2 kinetics in cheese matrix at 20°C position from interface (mm) A new methodology to monitor CO2 transfer and determine its diffusivity and solubility in solid food. 2012 EFFoST Annual Meeting - A Lunch Box for Tomorrow: An interactive combination of integrated analysis and specialized knowledge of food, Nov 2012, Montpellier, France. pp.1. hal-01601871

HAL Id: hal-01601871
https://hal.archives-ouvertes.fr/hal-01601871
Submitted on 6 Jun 2020

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- Predictive microbiology coupled with gas transfer in food/packaging systems View project
- Information Extraction for Adabidopsis Thaliana View project
A new methodology to monitor CO₂ transfer and determine its diffusivity and solubility in solid food

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Carbon dioxide is usually added in modified atmosphere packaging (MAP) to extend food shelf life by reducing microbial degradation with its bacteriostatic properties. MAP simulating tool based on the use of mass transfer models concomitantly with predictive microbiology would be the most appropriate method to allow a correct design and sizing of modified atmosphere packaging systems. Use of this model required first accurate determination of CO₂ solubility and diffusivity in solid food matrices.

Materials and Methods

Measurement principle:
- Impose a gradient of carbon dioxide to the sample and monitor the carbon dioxide transfer kinetic.
- Experimental design is to form a cylinder of the food matrix (2<x<8 cm) and apply at one end a flux of CO₂.
- After the phase of CO₂ diffusion (around 20 hours), the food matrix is rapidly demoulded and cut into fine slice (around 5 mm).
- CO₂ content is measured for each slice (time is a constant).

To determine the carbon dioxide content:
- Based on chemical titration used generally to measure the carbon dioxide content in food product and determine the carbon dioxide solubility.

Results

CO₂ kinetics in cheese matrix at 20°C

Discussion

This method to determine the CO₂ diffusivity is easy to implement and not expensive. It allows an evaluation of the kinetics of transfer of CO₂. The values obtained by this method are in agreement with various literature data, including the existing data of carbon dioxide diffusivity in water (a) and are in the same order of data in other food products, such as fish (b) or meat (c).

However, experimental efforts must be pursued to have the lowest measurement error. One of the steps is critical: the cheese is cut in slices out of a controlled atmosphere, and each slice is weighed before desorption. This should be done in the shortest time possible.

This work presents an easy and inexpensive method, to measure carbon dioxide kinetic in solid food. CO₂ concentration is measured for each slice at constant time. Diffusivity is identified from a mathematical model based on Fick’s second law. The first results obtain are in agreement with scientific literature data.

This work is done in the project MAP’Opt (2011-2015), funded by the French National Research Agency, whose full name is “Equilibrium gas composition in modified atmosphere packaging and food quality”.

References