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MULTI-RESPONSE MODELING OF THE MAILLARD REACTION IN A MODEL CHEESE

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Processed cheese derives from a secondary milk processing step that involves mixing and heating dairy (cheese, butter and milk powders) and non-dairy products (emulsifiers). This processing yields a homogeneous product, usually spreadable, with a shelf-life often longer than 6 months.

During cheese processing and storage, lipid oxidation, caramelization and Maillard reactions occur and produce odour-active compounds. In this study, a methodological approach was used in order to (i) identify odorants responsible for flavor attributes or compouds involved in the reaction chain, (ii) monitor the evolution of these markers during the heat treatment applied to the matrix, (iii) establish an observable reaction scheme and (iv) model and predict the evolution of these compounds during thermal operations.

In this aim, a model cheese and a cooking cell were elaborated. Various couplings of gas chromatography with olfactometry were used to identify odorous compounds. Two-dimensional comprehensive chromatography allowed a semi-quantitation of trace and ultra-trace compounds, while precursors were quantitated by high performance liquid chromatography. An observable reaction scheme of the Maillard reaction was extracted from these data and makes the multi-response modeling step possible despite a partial quantitation of the volatile compounds. Finally, we obtained a formal model combining 19 components (including four odorants) connected by 14 stoechiometric balanced reactions. This model makes it possible to predict the evolution of these components depending on the initial content of lactose, galactose and according to the heat treatment applied to the cheese matrix.

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