

The Research Group of
Industrial Microbiology and Food Biotechnology (IMDO)

has the honour to invite you to the public PhD defence of

ir. Simon VAN KERREBROECK

to obtain the degree of Doctor of Bioengineering Sciences

Sourdough fermentation processes: meta-analysis, impact of pH evolution, and online real-time monitoring by selected ion flow tube-mass spectrometry

Promotor:

Prof. Dr. ir. Luc De Vuyst

The defence will take place on

Friday, June 2, 2017, at 17 h

in Auditorium D2.01 of the Campus Humanities, Sciences and Engineering of the Vrije Universiteit Brussel, Pleinlaan 2, 1050 Elsene, and will be followed by a reception.

Members of the jury

Prof. Dr. ir. G. VERNIEST (VUB, chairman)

Prof. Dr. ir. E. PEETERS (VUB, secretary)

Prof. Dr. ir. L. DE VUYST (VUB, promotor)

Prof. Dr. D. MAES (VUB)

Prof. Dr. ir. S. EELTINK (VUB)

Prof. Dr. ir. H. VAN LANGENHOVE (UGent)

Prof. Dr. L. SETTANNI (University of Palermo, Italy)

Curriculum vitae

Simon Van Kerrebroeck (°10/07/1985, Leuven, Belgium) graduated from the Sint-Franciscusinstituut Evergem in 2003. He obtained his degree of MSc. in Bioscience Engineering (Chemistry) from Ghent University in 2008. In February 2011, he started his PhD research at IMDO-VUB under the supervision of Prof. Dr. ir. L. De Vuyst. In the period 2011-2016, he was assistant and responsible for practicals in industrial bioprocess technology. His research dealt with the use of SIFT-MS for the monitoring of sourdough fermentation processes. He is first author of two and co-author of six peer-reviewed publications in international journals and co-author of a peer-reviewed book chapter. He gave four talks at international conferences and contributed to 10 other oral and three poster presentations at the occasion of various meetings.

Abstract of the PhD research

Food fermentations are dynamic processes, which are generally monitored offline. Although online analysis of physicochemical parameters such as temperature and pH has become routine and online measurement of exhaust gases is possible, dynamic studies for the monitoring of process parameters and fermentation properties, in particular the production of volatile compounds, are lacking. This is particularly important for the follow-up of sourdough fermentation processes, which are started with non-sterile flour and other ingredients, are subject to contamination from the environment, in particular if performed spontaneously or through back-slopping, are fermented by communities of lactic acid bacteria (LAB) and yeasts under different process conditions, and are destined for the production of baked goods. The latter are often evaluated, both by consumers and producers, as to their aroma and flavour, whether or not by objective means.

The present study contributed to the development of methodologies to monitor sourdough fermentation processes online and in real-time, in parallel with off-gas analysis, based on selected ion flow tube-mass spectrometry (SIFT-MS). This is an easy-to-use and promising technique in the field of food and flavour analysis. In a first instance, ethanol as major volatile sample compound was detected with an optimized protocol. However, its high fermentor headspace concentrations influenced the measurements of other volatile sample compounds that are characteristic for the sourdough aroma profile. Therefore, an adapted workflow for the analysis of the SIFT-MS data was developed subsequently, which enabled the monitoring of the volatile sample compounds acetoin and ethyl acetate, together with ethanol, during the production of liquid wheat sourdoughs obtained by fermentation with several potentially interesting hetero- and homofermentative volatile-producing LAB starter culture strains and an acetic acid bacterial starter culture strain. Finally, SIFT-MS allowed to distinguish sourdoughs and breads from different origins.