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Challenges and Obstacles in Process Understanding and Monitoring with Process Analytical Technologies

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The use of Process Analytical Technology (PAT) in dairy industries can enhance manufacturing processes efficiency and improve final product quality by facilitating monitoring and understanding of these processes. Currently, near-infrared spectroscopy (NIR) is one of the most widely used optical technologies in PAT, thanks to its ability to fingerprint materials and simultaneously analyze various food-related phenomena. Recently, low-cost miniaturized NIR spectrometers, coupled with multivariate data analysis, have been employed to solve classification, discrimination, and quantification issues in various fields. However, implementing these technologies for online monitoring is still challenging.
In this study, a lab-scale feasibility study has been conducted to investigate the potentialities and limits of a handheld spectrometer for kefir fermentation. Multivariate statistical tools were intended to consider time dependency and dynamics over the process that happens through different phases. The possibilities offered by different statistical tools in gaining information about process occurrence were examined on the one hand, for process understanding and, on the other, for process monitoring and endpoint determination.
Exploiting data information showed great potential for miniaturized NIR in real-time monitoring and modeling of the fermentation process that could help close the loop for automated process management.

Keywords

process understanding, kefir fermentation, spectra

Classification

Mainly application

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