

The good, the bad and the aged: quality control of anhydrous milk fat by Proton Transfer Reaction Mass Spectrometry

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Abstract:

PTR-MS (Proton Transfer Reaction Mass Spectrometry) is an accurate, high sensitivity, direct-injection technique that allows for the rapid characterization of food products and for the monitoring of processes in food science and agro-industry, without any pre-treatment [1]. In the last years, the importance of this technology in food research has increased quickly and it has been applied to address different issues as the monitoring of volatile organic compound (VOCs) emission during time (e.g. shelf life or processing) and the rapid classification of food samples according, e.g., to quality or geographical origin [2].

This study aims at verifying whether rapid and direct headspace PTR-MS analysis can correctly classify anhydrous milk fat (AMF) samples according to classes defined by sensory analysis or accelerated shelf-life. 39 samples were divided in three classes (OK, BAD, AGED) according to sensory evaluation by 7 to 12 trained panelists (OK, BAD) or thermal treatment (AGED). Five replicates of each sample were then measured through PTR-ToF-MS for a total of about 200 measurements. Measurements were performed in an automated way using a multipurpose GC automatic sampler (Gerstel GmbH, Mulheim am Ruhr, Germany) connected to the inlet of a commercial PTR-ToF-MS 8000 instrument (Ionicon Analytik GmbH, Innsbruck, Austria). PTR-MS data were then extracted [3, 4]. Principal component analysis (PCA) was performed on the dataset of mass peaks belonging to AMF samples significantly different from blank samples (1-way ANOVA with Bonferroni correction, p.value <0.01). The analysis lead to a clear separation of the three different classes of AMF samples. PLS-DA was then performed to build a discrimination model. The correct classification with an exception of only one sample was obtained from the dataset contained all mass peaks.

This pilot study indicate that PTR-ToF-MS can be implemented as a rapid (less than 60 s per measurement) and efficient tool for anhydrous milk fat quality control in agroindustry.

References:

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