Detection of cheese whey wastewater VOCs using pre-concentrate extraction techniques followed by GC/MS

A new sample preparation method based on the use of the HiSorb probe was developed for the extraction and preconcentration of Volatile Organic Compounds (VOCs) from cheese whey wastewater before identification and determination by thermal desorption-gas chromatography/mass spectrometry (TD-GC/MS) analysis. The dairy industry leads to the production of a large volume of wastewater, which due to their composition present strong aroma characteristics. This study was conducted to compare the effectiveness between HiSorb and solid-phase microextraction (SPME), as the principle of operation of the former technique is similar to the latter, except that HiSorb is a more recent technique and offers more advantages. The experimental parameters of HiSorb were evaluated in terms of the type of probe coating, extraction time, stirring rate, sample volume, extraction temperature, and addition of salt. Under optimal extraction conditions, the HiSorb was compared with SPME to evaluate their effectiveness. It was observed that in both techniques the use of a triple coating, DVB/CWR/PDMS for HiSorb and DVB/CAR/PDMS for SPME, was the most suitable for extracting a wider range of VOCs with higher peak intensities. In total, 34 VOCs were extracted and determined with the DVB/CWR/PDMS HiSorb probe, whereas only 23 VOCs with DVB/CAR/PDMS SPME fiber. Due to the higher capacity of the adsorbent and the preconcentration of the analyzers in the cryo-trap of the TD unit, DVB/CWR/PDMS HiSorb probe showed 1.5 times higher sensitivity of total VOCs compared to the DVB/CAR/PDMS SPME fiber. In addition, the HiSorb method presents better reproducibility, as the relative standard deviation (RSD) of the total VOCs was 1.4%, while for SPME 2.7%. Concluding, the HiSorb technique can be used effectively to determine VOCs in complex matrices, such as that of cheese whey wastewater.