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Using Corona Discharge-Ion Mobility Spectrometry for Detection of 2,4,6-Trichloroanisole

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In this work possible application of the corona discharge-ion mobility spectrometer (CD-IMS) for detection of 2,4,6-Trichloroanisole (TCA) has been investigated. We applied CD-IMS interfaced with orthogonal acceleration time of flight mass spectrometer (CD-IMS-oaTOF) to study the ion processes within CD-IMS technique. The CD-IMS instrument was operated in two modes, i) standard and ii) reverse flow modes resulting in different chemical ionization schemes by $NO_3^-.(HNO_3)_n$ (n=0,1,2) and $O_2^-(H_2O)_n$(n=0,1,2), respectively. The $O_2^-(H_2O)_n$ ionization was associated with formation of Cl^- and $(TCA\text{-}CH_3)^-$ ions from TCA. The $NO_3^-.(HNO_3)_n$ ionization, resulted in formation of $NO_3^-.(HNO_3)$.(TCA-Cl) adduct ions. Limit of detection (LOD) for TCA was determined in gas (100 ppb) and solid phases (150 ng).

1. Introduction

The wine industry and consumers themselves deem that wine aroma is an important attribute of product quality. The presence of halo-anisoles is an enological problem in wine industry because of their low sensory threshold. Trichloroanisole (TCA), particularly the 2,4,6-TCA isomer, is considered as the main substance causing the unpleasant odour of wine also known as “cork taint”, mentioned in some researches [1,2]. This musty, mouldy odour of tainted wine originating from the cork material is directly detected by consumers of wine and is defined as similar to wet cardboard, mushrooms, earthy smell, etc [1]. The dominant mechanism for generation of 2,4,6-TCA, not a naturally creating compound, is process of O-methylation of 2,4,6-trichlorophenol (2,4,6-TCP) by filamentous fungi [3]. The concentration considered as an appreciable defect in wine ranges from 10-40 $ng.L^{-1}$[4]. TCA is presumed as the major culprit for tainted wine that influences directly wine producers. Their financial losses due to this unacceptable flavour are calculated to be in billion US dollars range [5].

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