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Ion mobility spectrometry as a fast analytical tool in benzalkonium chloride homologs determination

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Abstract

A novel procedure is proposed for the determination by ion mobility spectrometry (IMS) of C_{12}, C_{14} and C_{16} benzalkonium chloride (BAC) homologs. The proposed method requires minimum sample treatment and the measurement was made in less than one minute. A high sensitivity was obtained for BAC determination by IMS with limit of detection values from 37 to 69 µg L^{-1}. Accuracy of the proposed methodology was evaluated through the analysis of aqueous and alcoholic samples spiked with BAC at concentration levels from 0.002 to 20 % (w/v), providing recovery values from 91 to 104 %. BAC was determined in sanitary alcohols, nasal sprays, postharvest products, algaecides, and treated swimming pool water. Results obtained by the proposed IMS methodology were statistically comparable to those provided by a liquid chromatography-ultraviolet (LC-UV) reference methodology. The Green Certificate evaluation of the proposed IMS methodology provided 91 score points in the Eco-Scale as compared with 77 for LC-UV method.

Graphical Abstract

Keywords: Benzalkonium chloride, Ion mobility spectrometry, Quality control, Green Analytical Chemistry

1. Introduction

Benzalkonium chloride (BAC) is a mixture of benzyl alkyldimethyl ammonium chlorides [C_6H_5 CH_2 $N(CH_3)_2$ R Cl] in which the alkyl group, R, has a chain length from 8 to 18 carbon atom number. In general, the most commonly used BAC homologs are those with dodecyl (C_{12}-BAC), tetradecyl (C_{14}-BAC) and hexadecyl (C_{16}-BAC) substituents [1,2].

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