

EC vapour analysis of DANISH SWIRL

Background

Electronic cigarettes (e-cigarettes) are growing in popularity exponentially in many parts of the world. In spite of their ever-growing acceptance, relatively little work has been carried out to characterize their vapour. The electronic liquid used consists of propylene glycol, glycerol, distilled water, appropriate flavorings and nicotine. The present work involves the analysis of vapour by HPLC-DAD

1. Description of Vapour Analysis

The vapour was generated on a E-Cigarette, single 100 ml puff, with a puff duration of 5 s at 30 W and the vapour was trapped in a glass thermal desorption syringe for HPLC-DAD analysis. The tanks were thoroughly washed and dried after each sample analysis and a new coil was used for each sample.

The sample was tested by using CIEQB in house developed method for quantitative determination of Nicotine, Propylene Glycol, Glycerine, Diethylene glycol, Ethylene Glycol, Acetone, Acetoin (flavouring), Diacetyl, 2,3-Pentanedione (acetyl propionyl) , Propylene oxide, Acrolein, Formaldehyde and Acetaldehyde by running standards which were obtained from Sigma Aldrich.

2. HPLC- UV/DAD Method

The sample was analysed by CIEQB to determine the Nicotine, Propylene Glycol, Glycerine, Diethylene Glycol, Ethylene Glycol, Acetone, Acetoin (flavouring), Diacetyl (flavouring), 2,3-Pentanedione ,(acetyl propionyl) (flavouring), Propylene Oxide (produced when propylene glycol is heated), Acrolein (produced when glycerine is heated), Formaldehyde (degradation of PG) and Acetaldehyde (degradation of PG) present in vapour by HPLC-DAD by using UV, RI and PDA detectors. As far as volatile organic compounds (VOCs) are concerned, single 100 ml puff was previously trapped in a suitable solid support containing 2,4-dinitrophenylhydrazine (DNPH) which were eluted and analysed by HPLC-DAD.

Column: C18 Atlantis

Temperature: 35 °C

Analysis Time: 10 min

Injection Vol: 20 l

Detection: PDA, UV and RI

Eluent: 50:50 acetonitrile : water containing 0,1% triethylamine

3. Calibration curves

All analytical standards were obtained from Sigma Aldrich and calibration curves were carried out for all these compounds. As far as the carbonyl compounds are concerned (i.e, formaldehyde, acrolein and acetaldehyde), 2,4 dinitrophenylhydrazones for each compound were prepared and analysed by HPLC-DAD. Recovery experiments were carried out in order to validate this assay method.

The concentration of these compounds was determined as mg/ml from the calibration curve and from these data, % compound was calculated (i.e g/100 ml). The limit of detection (LOD) of this HPLC method was 0.001%, in other words, 1 mg/100 ml or 10 mg/ liter. All assays were carried out in triplicates and the results are presented with standard deviation

4. Results

Samples was tested by this HPLC methodology and the results obtained are presented in Table 1.

Table 1

Sample Name	Results (%)
BOW018	
TEST %	
The following compounds were tested: Nicotine, Propylene Glycol, Glycerine, Diethylene glycol, Ethylene Glycol, Acetone, Acetoin (flavouring), Diacetyl, 2,3-Pentanedione, (acetyl propionyl), Propylene oxide, Acrolein, Formaldehyde and Acetaldehyde by running standards which were obtained from Sigma Aldrich.	
Nicotine	0,006 ±0,0002
Propylene Glycol	0,187 ±0,020
Glycerine	0,390 ±0,040
Diethylene Glycol	N.D.*
Ethylene Glycol	0,024 ±0,002
Acetone	N.D.*
Acetoin (flavouring)	N.D.*
Diacetyl (flavouring)	N.D.*
2,3-Pentanedione (acetyl propionyl) (flavouring)	N.D.*
Propylene Oxide (produced when propylene glycol is heated)	N.D.*
Acrolein (produced when glycerine is heated)	0,172 ±0,018
Formaldehyde (degradation of PG)	0,054 ±0,005

	Acetaldehyde (degradation of PG)	0,091 ±0,010
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N.D.* – Not detected

This test was carried out in March 2017 at Chemical Engineering and Biotechnology Research Center of Instituto Superior de Engenharia de Lisboa by:

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