



CHEMNOVATIC

CHEMNOVATIC Sp. z o.o. Sp. k.
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ANALYSIS REPORT NO 2023/07/0013/006_EN

DATE: 21.07.2023

Particulars of the Client	Particulars of the sample/Description of the designation	
SUBSTITUTE SRL Sibiu, strandului, 4 Romania	Quantitative determination of aerosol components derived from e-liquids, according to agreed specification	
	Sample number	Client`s designation
	2023/07/0013/006	Lichid smokemania Fresco 60vg 40pg 18mg

Date of receipt of samples: 7th July 2023
Date of completion of the analyses: 21th July 2023

The analyses have been conducted by:

CHEMNOVATIC Sp. z o.o. Sp. k.
Ludwika Spiessa 9
20-270 Lublin
VAT No PL946-264-59-31

Description of the delivered samples:

Transparent solutions of significant viscosity supplied in plastic containers.



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Results:

1. Sample mass and puffs number for tobacco-specific nitrosamines, aldehydes and ketones determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Sample mass at 40 puffs. Vaping process to acetonitrile.	2020/036 Ed. 3 of 05.05.2023, NA	0,3331	-	g

2. Sample mass and puffs number for nicotine, propylene glycol, glycerin and volatile organic compounds determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Sample mass at 40 puffs. Vaping process to methanol.	2020/036 Ed. 3 of 05.05.2023, NA	0,2679	-	g

3. Sample mass and puffs number for heavy metals determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Sample mass at 40 puffs. Vaping process to water.	2020/036 Ed. 3 of 05.05.2023, NA	0,3144	-	g

4. Results of heavy metals determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Content of lead Pb	2020/042 Ed. 1 of 03.09.2020, NA	<LOQ	-	µg/g
	Content of cadmium Cd		<LOQ	-	
	Content of arsenic As		<LOQ	-	
	Content of chrome Cr		<LOQ	-	
	Content of nickel Ni		<LOQ	-	
	Content of copper Cu		<LOQ	-	
	Content of aluminum Al		<LOQ	-	
	Content of tin Sn		<LOQ	-	
Content of iron Fe	<LOQ	-			



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5. Results of volatile organic compounds determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Uncertainty	Unit
2023/07/0013/006	Average content of benzene	2020/037 Ed. 1 of 03.09.2020, NA	<LOQ	-	µg/g
	Average content of xylenes		65,2	20,86	
	Average content of toluene		<LOQ	-	
	Average content of isoprene		<LOQ	-	
	Average content of 1,3-butadiene		<LOQ	-	
	Average content of ethylene glycol		<LOQ	-	
	Average content of diethylene glycol		<LOQ	-	

6. Results of aldehydes and ketones determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Average content of formaldehyde	2020/040 Ed. 1 of 03.09.2020, NA	6,05	1,82	µg/g
	Average content of acetaldehyde		4,90	1,47	
	Average content of acrolein		<LOQ	-	
	Average content of crotonaldehyde		<LOQ	-	
	Average content of isovaleraldehyde		<LOQ	-	
	Average content of o,m,p-tolualdehyde		<LOQ	-	
	Average content of hexaldehyde		<LOQ	-	
	Average content of diacetyl	2020/037 Ed. 1 of 03.09.2020, NA	<LOQ	-	
	Average content of acetyl propionyl		<LOQ	-	



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7. Results of tobacco-specific nitrosamines determination.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Standard Deviation	Unit
2023/07/0013/006	Average content of NNK	2020/039	<LOQ	-	µg/g
	Average content of NNN	Ed. 2 of 22.10.2020, NA	<LOQ	-	

8. Results of nicotine, propylene glycol and glycerin determination after heating e-liquid.

Sample signature	Subject of determination	Method identification**	The result of the analysis	Uncertainty	Unit
2023/07/0013/006	Average content of propylene glycol	2020/038 Ed. 3 of 03.09.2020, NA	135,0	14,8	mg/g** *
	Average content of glycerin	2020/038 Ed. 3 of 03.09.2020, NA	703,6	77,4	
	Average content of nicotine	2020/038 Ed. 3 of 03.09.2020, A	11,3	1,2	
	Average number of puffs	NA	40	-	-
	Average nicotine dose per puff		0,08	0,01	mg/puff

** Determination method: A-accredited, NA-non-accredited, AS- accredited subcontractor, NAS – non-accredited subcontractor.

*** amount of nicotine [mg] per 1 g of vaped liquid; LOQ – limit of quantification.

Additional information:**I. Sampling conditions:**

Sampling parameters:

- The air flow through the system was 1,1 L/min.
- The test consists of 3 sec. puff and 27 sec. relaxation time interval.
- Heater resistance: 1,5 Ω.
- The voltage applied to the heater: 3,7 V.
- The temperature of transfer line was set in the range of 80-100 °C.
- Used device: Volish.

II. Heavy metals determination method:

The aerosol was collected into the ultrapure water with nitric acid (trace analysis quality) in the absorber. The samples were analyzed directly on Agilent ICP-OES VDV 5100 System in the axial mode. The cyclon chamber and glass nebulizer was used. The RF Power was 1,20 kW and the plasma flow of argon was 12 L/min.



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Table 1. The Limits of quantification of heavy metals.

Subject of designation	Unit	Limit of quantification
Content of lead Pb	µg/g	10,00
Content of cadmium Cd	µg/g	10,00
Content of arsenic As	µg/g	10,00
Content of chrome Cr	µg/g	10,00
Content of nickel Ni	µg/g	10,00
Content of copper Cu	µg/g	10,00
Content of aluminum Al	µg/g	10,00
Content of tin Sn	µg/g	10,00
Content of iron Fe	µg/g	10,00

III. Volatile Organic Compounds determination method:

The aerosol was collected to methanol in the absorber. Analysis of the standard solutions and the samples was performed with gas chromatography combined with mass spectrometry Shimadzu GCMS-QP2010 SE System. The quantitative analysis were performed in split injection mode by gradient temperature program and SIM detector mode. The Zebron WAX column was used with parameters: 30 m length; 0,25 I.D. mm and 0,25 µm of film thickness.

Table 2. The limits of quantification of volatile organic compounds.

Subject of designation	Unit	Limit of quantification
Content of benzene	µg/g	50,0
Content of xlenes	µg/g	50,0
Content of toluene	µg/g	50,0
Content of isoprene	µg/g	50,0
Content of 1,3-butadiene	µg/g	50,0
Content of ethylene glycol	µg/g	250,0
Content of diethylene glycol	µg/g	50,0

IV. Aldehydes and ketones determination method:

The aerosol was collected to acetonitrile in the absorber. The analytes were derivatized in acetonitrile solution by 2,4-DNPH (dinitrophenylhydrazine in phosphoric acid). Analysis of the standard solutions and the samples was performed using ultraperformance liquid chromatography with diode-array detector coupled with tandem mass spectrometry UHPLC-PDA/MS/MS Shimadzu Nexera X2 8040. The Luna Omega column (1.6 µm; C 18; 100 A LC Column 100x2.1 mm) was used for the determinations.



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Table 3. The limits of quantification of aldehydes and ketones.

Subject of designation	Unit	Limit of quantification
Content of formaldehyde	µg/g	2,15
Content of acetaldehyde	µg/g	2,95
Content of acrolein	µg/g	3,56
Content of crotonaldehyde	µg/g	4,21
Content of isovaleraldehyde	µg/g	4,86
Content of o,m,p- tolualdehyde	µg/g	6,01
Content of hexaldehyde	µg/g	5,36
****Content of diacetyl	µg/g	50,0
****Content of acetyl propionyl	µg/g	25,0

****The aerosol was collected to methanol in the absorber. Analysis of the standard solutions and the samples was performed with gas chromatography combined with mass spectrometry Shimadzu GCMS-QP2010 SE System. The quantitative analysis were performed in split injection mode by gradient temperature program and SCAN and SIM detector mode. The Zebron WAX column was used with parameters: 30 m length; 0,25 I.D. mm and 0,25 µm of film thickness.

V. Tobacco-specific nitrosamines determination method:

The aerosol was collected to acetonitrile into the absorber. Analysis of the standard solutions and the samples was performed using ultraperformance liquid chromatography with diode-array detector coupled with tandem mass spectrometry UHPLC-PDA/MS/MS Shimadzu Nexera X2 8040. The Luna Omega column (1.6 µm; C 18; 100 A LC Column 100x2.1 mm) was used for the determinations.

Table 4. The limits of quantification of tobacco-specific nitrosamines.

Subject of designation	Unit	Limit of quantification
Content of TSNA: 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	µg/g	2,5
Content of TSNA: N-nitrosonornicotine (NNN)		2,5

VI. Nicotine, propylene glycol and glycerin determination method:

The aerosol was collected to methanol into the absorber. Analysis of the standard solutions and the samples was performed with gas chromatography combined with flame ionization detector Shimadzu GC2010 Plus System. The quantitative analysis were done in split injection mode by isothermal and gradient temperature program. The Zebron ZB-624 column was used with parameters: 30 m length; 0,32 I.D. mm and 1,8 µm of film



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thickness.

Table 5. The limits of quantification of nicotine.

Subject of designation	Unit	Limit of quantification
Content of nicotine in aerosol after heating	mg/g	2,5
Average nicotine dose per puff	mg/puff	0,0625

END OF REPORT

The report may not be published, in whole or in part, without the written consent of

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The obtained result applies only to the tested (received) samples.

Approved by:	Marcin Górecki Manager of Legal Regulations Department
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