

E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 1 of 9

Applicant: ALD GROUP LIMITED

Address: ALD Building NO.2 Industrial 3rd Road, ShiXin Community, Shiyan Town,
Bao'An District, Shenzhen 518108, China.

The following sample was submitted and identified by/on behalf of the client as:

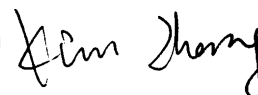
Sample Name: VTOP battery
Model No.: VTOP battery
MOD: 380mah
Power level in testing: Voltage/Wattage of tested sample is un-adjustable
Adjustable air inlet or not: No
Trade Mark: ALD AMAZE
Sample Received Date: 2018.01.31
Testing Period: 2018.01.31—2018.03.02
Test Requested:
1. As specified by client, to determine the Carbonyl Compounds content(s) in aerosol generated by the submitted sample.
2. As specified by client, to determine the Metals content(s) in aerosol generated by the submitted sample.
3. As specified by client, to determine Nicotine consistency in aerosol generated by the submitted sample.
4. As specified by client, to determine Diacetyl and Pentane 2,3 dione content(s) in aerosol generated by the submitted sample.
5. As specified by client, to determine Ethylene Glycol and Diethylene Glycol in aerosol generated by the submitted sample.
6. As specified by client, to determine Specific Nitrosamines content in aerosol generated by the submitted sample.
7. As specified by client, to determine VOC substances content(s) in aerosol generated by the submitted sample.
Test Method: Please refer to the following page(s).
Test Result(s): Please refer to the following page(s).
Remark: Test data of this report was extracted from report No. TCT180131C019.

Checked by



Noel Yin

Signed for and on behalf of TCT



Kim Zhang
Technical Manager



E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 2 of 9

Test Results:

Test Condition for test items except Nicotine consistency test:

With reference to the CORESTA RECOMMENDED METHOD N° 81 method parameter and Afnor standardization XP D90-300-3, a smoke machine was used to collect the vapor.

| | |
|--------------------------------|------------------|
| Puff Duration | 3.0s±0.1s |
| Puff Volume | 55mL±0.3mL |
| Puff Frequency | 30s±0.5s |
| Puff of Each Group | 20 |
| Group Interval Time | 300s±120s |
| Maximum Flow | 18.5mL/s±1.0mL/s |
| Pressure Drop | < 50hPa |
| Group | 5 |
| Total Number of Puff | 100 |
| Total Duration of Vaporization | 300s |

The temperature and relative humidity of the test atmosphere during machine preparation and testing shall be kept within the following limits: temperature $\pm 2^{\circ}\text{C}$, relative humidity $\pm 5\%$

Sample Description:

1. VTOP battery

E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 3 of 9

1. Carbonyl Compounds Content(s)

Method: Using volumes based on the desired dilution, a measured volume of sample was combined with a volume of DNPH solution and vortexed. After sitting for 20 minutes at ambient temperature, the sample was then quenched with a sufficient amount of pyridine. An aliquot was then analyzed using the Agilent Model 1200, High Performance Liquid Chromatograph equipped with an Ultraviolet (UV) Detector operating at 365 nm.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|----------------|-----------|-------------|-------|-----|------------|
| | | | | | 1 |
| Formaldehyde | 50-00-0 | ug/100puffs | 0.667 | 2 | 6.50 |
| Acetaldehyde | 75-07-0 | ug/100puffs | 0.667 | 2 | 5.14 |
| Acrolein | 107-02-8 | ug/100puffs | 0.667 | 2 | ND |
| Crotonaldehyde | 4170-30-3 | ug/100puffs | 0.667 | 2 | ND |

- Note:
- ug = Microgram
 - ND = Not Detected (lower than MDL)
 - MDL = Method Detection Limit
 - LOQ = Limit of Quantitation

E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 4 of 9

2. Metals Content(s)

Method: The vapor was passed through a dry-ice cooled impinger containing glass packing beads and quartz wool. After smoking the impinger was extracted with 5% nitric acid and filtered through quartz wool. An aliquot of the resulting solution was submitted for analysis by ICP-OES.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|---------------|-----------|-------------|-------|------|------------|
| | | | | | 1 |
| Aluminium(Al) | 7429-90-5 | ug/100puffs | 0.025 | 0.25 | ND |
| Chromium(Cr) | 7440-47-3 | ug/100puffs | 0.005 | 0.05 | ND |
| Iron(Fe) | 7439-89-6 | ug/100puffs | 0.005 | 0.05 | ND |
| Nickel(Ni) | 7440-02-0 | ug/100puffs | 0.025 | 0.25 | ND |
| Tin(Sn) | 7440-31-5 | ug/100puffs | 0.25 | 2.5 | ND |
| Lead(Pb) | 7439-92-1 | ug/100puffs | 0.025 | 0.25 | ND |
| Cadmium(Cd) | 7440-43-9 | ug/100puffs | 0.005 | 0.05 | ND |
| Arsenic(As) | 7440-38-2 | ug/100puffs | 0.025 | 0.25 | ND |
| Antimony(Sb) | 7440-36-0 | ug/100puffs | 0.025 | 0.25 | ND |

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E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 5 of 9

3. Nicotine Consistency Test

Test Condition: With reference to the CORESTA RECOMMENDED METHOD N° 81 method parameter and Afnor standardization XP D90-300-3, a smoke machine was used to collect the vapor.

| | |
|--------------------|------------------|
| Puff Duration | 3.0s±0.1s |
| Puff Volume | 55mL±0.3mL |
| Puff of Each Group | 20 |
| Maximum Flow | 18.5mL/s±1.0mL/s |
| Pressure Drop | < 50hPa |

The temperature and relative humidity of the test atmosphere during machine preparation and testing shall be kept within the following limits: temperature ±2°C, relative humidity ±5%

Method: A reference liquid was prepared. A pharmaceutical nicotine inhaler was used as a comparator. Products were attached to a smoke machine, and the aerosol was collected in Cambridge filter pads. After trapping and solvent extraction, solution was analyzed by GC-MS and nicotine was dosed by comparing the areas obtained on the MS detector with those of standard solutions prepared in the laboratory under concentration conditions surrounding those of the samples.

| Sample Description | Nicotine(CAS No.:54-11-5) Contents(mg / 20 Puffs) | | | | | | Total(mg/100puffs) |
|--------------------|---|---------|----------|---------|----------|-------|--------------------|
| | Group 1* | Group 2 | Group 3* | Group 4 | Group 5* | AVG | |
| VTOP battery | 0.788 | 0.893 | 0.917 | 0.929 | 0.882 | 0.882 | 4.41 |
| Deviation(%) | 10.6 | - | 4.0 | - | 0 | - | - |

- Note:
- mg = milligram
 - ND = Not Detected (lower than MDL)
 - MDL = Method Detection Limit = 0.01 mg / 20 Puffs
 - LOQ = Limit of Quantitation = 0.1 mg / 20 Puffs
 - 1group = 20 puffs
 - * Values used for determination of consistency of nicotine emission
 - Under the conditions of the test and with reference to AFNOR XP D90-300-3, the electronic cigarette delivers a dose of nicotine at consistent levels.

E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 6 of 9

4. Diacetyl and Pentane 2,3 dione Content(s)

Method: The principle of collection and trapping of Diacetyl and Pentane 2,3 dione resides in the generation of aerosols (via a vaporisation system or an electronic cigarette) and the driving of these aerosols to a Diacetyl and Pentane 2,3 dione trapping system: a bubbler containing Ethanol. Then analyze the trapped solutions by GC-MS.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|-------------------|----------|-------------|-------|------|------------|
| | | | | | 1 |
| Diacetyl | 431-03-8 | ug/100puffs | 0.546 | 5.46 | ND |
| Pentane 2,3 dione | 600-14-6 | ug/100puffs | 0.546 | 5.46 | ND |

- Note:
- ug = Microgram
 - ND = Not Detected (lower than MDL)
 - MDL = Method Detection Limit
 - LOQ = Limit of Quantitation

5. Ethylene Glycol and Diethylene Glycol Content(s)

Method: Products were attached to a smoke machine, and the aerosol was collected in Cambridge filter pads. After trapping and solvent extraction, solution was analyzed by GC-MS and Glycols were dosed by comparing the areas obtained on the MS detector with those of standard solutions prepared in the laboratory under concentration conditions surrounding those of the samples.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|-------------------|----------|-------------|-------|-----|------------|
| | | | | | 1 |
| Ethylene Glycol | 107-21-1 | ug/100puffs | 0.667 | 2 | ND |
| Diethylene Glycol | 111-46-6 | ug/100puffs | 0.667 | 2 | ND |

- Note:
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 - MDL = Method Detection Limit
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E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 7 of 9

6. Specific Nitrosamines Content(s)

Method: The vapor was trapped on a Cambridge filter, after addition of an internal standard, the total particulate matter collected on the Cambridge filter was extracted into ammonium acetate solution using a shaker for a period time. The extract was syringe filtered through a 0.45 µm PTFE column directly into an auto sampler vial. The samples are subjected to LC-MS/MS.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|---|------------|-------------|-------|------|------------|
| | | | | | 1 |
| N-nitrosornicotine(NNN) | 16543-55-8 | ug/100puffs | 0.004 | 0.04 | ND |
| 4-(N-methylnitrosamino)-1-(3-pyridyl)-1-butanone(NNK) | 64091-91-4 | ug/100puffs | 0.004 | 0.04 | ND |

- Note:
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 - ND = Not Detected (lower than MDL)
 - MDL = Method Detection Limit
 - LOQ = Limit of Quantitation

E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 8 of 9

7. VOC substances content(s)

Method: The principle of collection and trapping of VOC substances resides in the generation of aerosols (via a vaporisation system or an electronic cigarette) and the driving of these aerosols to a VOC substances trapping system: a bubbler containing Methanol. Then analyze the trapped solutions by GC-MS.

| Test Item | CAS No. | Unit | MDL | LOQ | Content(s) |
|---------------|----------|-------------|-------|-----|------------|
| | | | | | 1 |
| Toluene | 110-88-3 | ug/100puffs | 0.667 | 2 | ND |
| Benzene | 71-43-2 | ug/100puffs | 0.667 | 2 | ND |
| 1,3-Butadiene | 106-99-0 | ug/100puffs | 0.667 | 2 | ND |
| Isoprene | 78-79-5 | ug/100puffs | 0.667 | 2 | ND |

- Note:
- ug = Microgram
 - ND = Not Detected (lower than MDL)
 - MDL = Method Detection Limit
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E-Cigarette Aerosol Analysis Report

Report No. : TCT180131C905

Date : Mar. 02, 2018

Page No.: 9 of 9

Photo(s) of the sample(s)



VTOP battery

***** End of Report *****

Remark: This report is considered invalidated without the Special Seal for Inspection of the TCT. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of TCT, this test report shall not be copied except in full and published as advertisement.