



**Analysis of Components from**  
**"e-Juice XX HIGH 36mg/ml rated**  
**Nicotine Solution" ref S 55434**

Report Number: E249A

Mike Ellicott

11 June 2009

**LPD Laboratory Services**  
***Blackburn MicroTech Solutions Ltd.***

Philips Road

Blackburn

Lancashire, BB1 5RZ

United Kingdom

*www.lpdlabservices.co.uk*

*enquiries@lpdlabservices.co.uk*

Tel 01254-507379

Fax 01254-507402

*Hertfordshire County Council,*

Hertfordshire Trading Standards,

45 Grosvenor Road,

St. Albans AL1 3AW

This report shall not be reproduced  
except in full, without written  
approval of the laboratory

## 1. Background

One bottle of "e-Juice XX HIGH 36mg/ml rated Nicotine Solution" was supplied for analysis by "Hertfordshire Trading Standards" to confirm the components currently found within the Nicotine Solution formulation, and consider what is the appropriate Legislation for dealing with the product.

Solutions of this type can be used in an electronic cigarette which replicates the action of smoking, producing a tobacco aromatized smoke which when inhaled quickly delivers the nicotine to the lung.

The Electronic Cigarette cartridges do not contain "Tobacco" as such, but are formulated using a refined tobacco leaf extract, where the extract used in manufacture may typically contain  $\geq 95\%$  Nicotine. The ES cartridges should therefore be exempt from the current Tobacco Legislation.

Nicotine is classified as a poison and is on the "Poisons List A", however, there are "No special restrictions to any purchasing group". It is therefore appropriate to deal with the ES cartridges under the CHIP Regulations.

## 2. Evidential Samples

An evidence bag was received on the **08/06/2009** from **Hertfordshire Trading Standards** containing: -

- **Hertfordshire Trading Standards reference number S 55434**
- **1 small bottle of "e-Juice XX HIGH 36mg/ml rated Nicotine Solution"**
- **Obtained from Digital Dynamics on the 18/03/2009 at 12:00 hrs**

The evidence bag was opened on the **08/06/2009** by Mike Ellicott.

## 3. Sample Extraction for GC-MS

The sample was analyzed undiluted (neat) by the GC-MS method.

## 4. GC-MS Method

The sample was analyzed by an external flavour laboratory to determine the components present by GC-MS (gas chromatography mass-spectrometry). The analysis was carried out on **01/06/2009**.

Column: Alltech Flavour & Essences Capillary Column – 30 m x 250  $\mu\text{m}$  x 0.5  $\mu\text{m}$

Temperature: 50°C 4 min, ramp 10°C/min to 210°C

Analysis Time: 81 min

Injection: Split

Carrier gas: Helium

The GC method employed may not detect some less volatile components that may be found in the sample, or where components are present in such low levels that they are below detection limits for the GC-MS method.

The GC method employed was of the '**normalization type**' where the detector response for each eluted component was set at the default value of 1.000 and the peak areas normalized to evaluate nominal area percentage value for each eluted component.

The GC-MS method will screen for the various chemical present in the nicotine solution (qualitative analysis) and give some indication of the levels of the various chemicals as a 'nominal area percentages' (semi-quantitative analysis). The nominal area percentage figure for nicotine may or may not be an accurate representation of the 'true' nicotine concentration.

If accurate nicotine levels are required, then it is advisable to use an alternative method such as the 'nicotine assay test' which uses a traceable nicotine drug standard for method calibration.

## 5. GC-MS Results

The sample was not diluted for analysis, and the results relate to the sample as received.

**Table 1 – Summary of GC-MS peak identification, CAS Number, and associated Risk Phrases**

No	Name	Nominal %	CAS No.	Effects to Humans of pure product in isolation
1	1,3-bis(3-phenoxyphenoxy) Benzene	20.16	2455-71-2	Non hazardous
2	Ethanol	0.50	64-17-5	R11 = Highly flammable
3	Propylene Glycol	51.21	57-55-6	Not currently recognized as giving any health hazards. However, it is listed as a suspected respiratory toxicant, suspected skin or sense organ toxicant, suspected neurotoxicant, and a suspected immunotoxicant.
4	3-Cyclohexene-1-menthol, .alpha.,.alpha.4-trimethyl	0.45	98-55-5	No information
5	Nicotine	9.97	54-11-5	R27 = Very Toxic in contact with skin R25 = Toxic if swallowed R51/53 = Toxic to aquatic organisms, may cause long term adverse effects in the aquatic environment
6	Glycerin	15.02	56-81-5	Non Hazardous
7	Vanillin	1.25	121-33-5	No information

**Reference was made to the EINECS online information system to determine hazard information for each individual component identified by GC-MS.**

## 6. Discussion

The components of the “**e-Juice XX HIGH 36mg/ml rated Nicotine Solution**” nicotine solution have been investigated by LPD Laboratory Services, in order to confirm the components currently found within the Nicotine Solution formulation contained within the cartridges, classify the preparation according to the hazards identified, and specify the labelling and packaging requirements in relation to the CHIP regulations.

This nicotine solution contains the addictive yet poisonous nicotine component at a nominal area percentage of 9.97 % by GC-MS, **and has additionally been quantified by a nicotine assay test at 3.14 %<sup>4</sup>** using traceable drug standards.

This chemical carries the risk phrases<sup>2</sup> R25 = toxic if swallowed, R27 = very toxic in contact with skin, and R51/53 = Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

*These risk phrases will need to be considered in relation to the products classification under the CHIP Regulations. As the nicotine level is above 1% but under the 7% level the preparation will require to be labelled “Toxic” for health effect, but as the nicotine level is under 25% in the preparation, the preparation does not require to be labelled as “Dangerous for the environment”,*

*The principal aerosol forming solvents found appear to be*

- |                                     |          |
|-------------------------------------|----------|
| • 1,3-bis(3-phenoxyphenoxy) Benzene | 21.60 %  |
| • Propylene glycol                  | 51.21 %  |
| • Glycerol                          | 15.02 %. |

Different suppliers of ‘Propylene glycol’ chemical appear to offer differing hazard ratings on their respective MSDS’s. Some indicate no ill effects from inhalation which is fine, while others irritating to the eyes and skin, or CNS and spleen health issues may exist from prolonged inhalation of the chemical.

Researching the chemical profile for propylene glycol<sup>1</sup> indicates that the chemical is ‘suspected to be a respiratory toxicant’. Propylene glycol may subsequently become ‘recognized as a respiratory toxicant’ in the future.

Several additives are found which would give the nicotine solution a characteristic aroma. These include: -

- 3-Cyclohexene-1-menthol, .alpha.,.alpha.4-trimethyl (which is an alpha-Terpinol)
- Vanillin

## 7. CHIP Regulations

Using the Chemicals (Hazard Information and Packaging for Supply) Regulations 2002<sup>3</sup>, the "**e-Juice XX HIGH 36mg/ml rated Nicotine Solution**" preparation is required to be: -

Classified as: -

- ✓ "Toxic" - for preparations containing nicotine at concentrations is  $\geq 1\%$  but  $< 7\%$

Labelling information required: -

- ✓ Toxic if swallowed (R25)
- ✓ Very Toxic in contact with skin (R27)
- ✓ Keep locked up and out of the reach of children (S1/2)
- ✓ In case of accident or you feel unwell, seek medical advice immediately (S45)
- ✓ Relevant hazard symbols



Packaging must be fitted with: -

- ✓ Tactile warning device
- ✓ Child resistant fastenings

## 8. References

1. [www.scorecard.org/chemical-profiles](http://www.scorecard.org/chemical-profiles); The Pollution Information Site for chemical "Propylene Glycol"
2. EINECS online information system
3. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
4. Nicotine Assay Report E249C

Analysts Name: Mike Ellicott

Function: Senior Applications Scientist

Signature: (hard copy only) \_\_\_\_\_

End of Report