

“Why, sometimes I've believed as many as  
six impossible things before breakfast.”

*-Alice*

# E-cigarettes & E-liquid

*Where there's Vapor.....is there Fire?*

Don Stillwaugh  
Pinellas County, FL SQG Program

RCRA Interpretative Network (RIN)  
21 September 2016



**SUSAN THURSTON**

*What's In Store*

## *Business for e-cigs lights up in 2014*

**I**f they haven't already, vape shops are coming soon to a strip center near you.

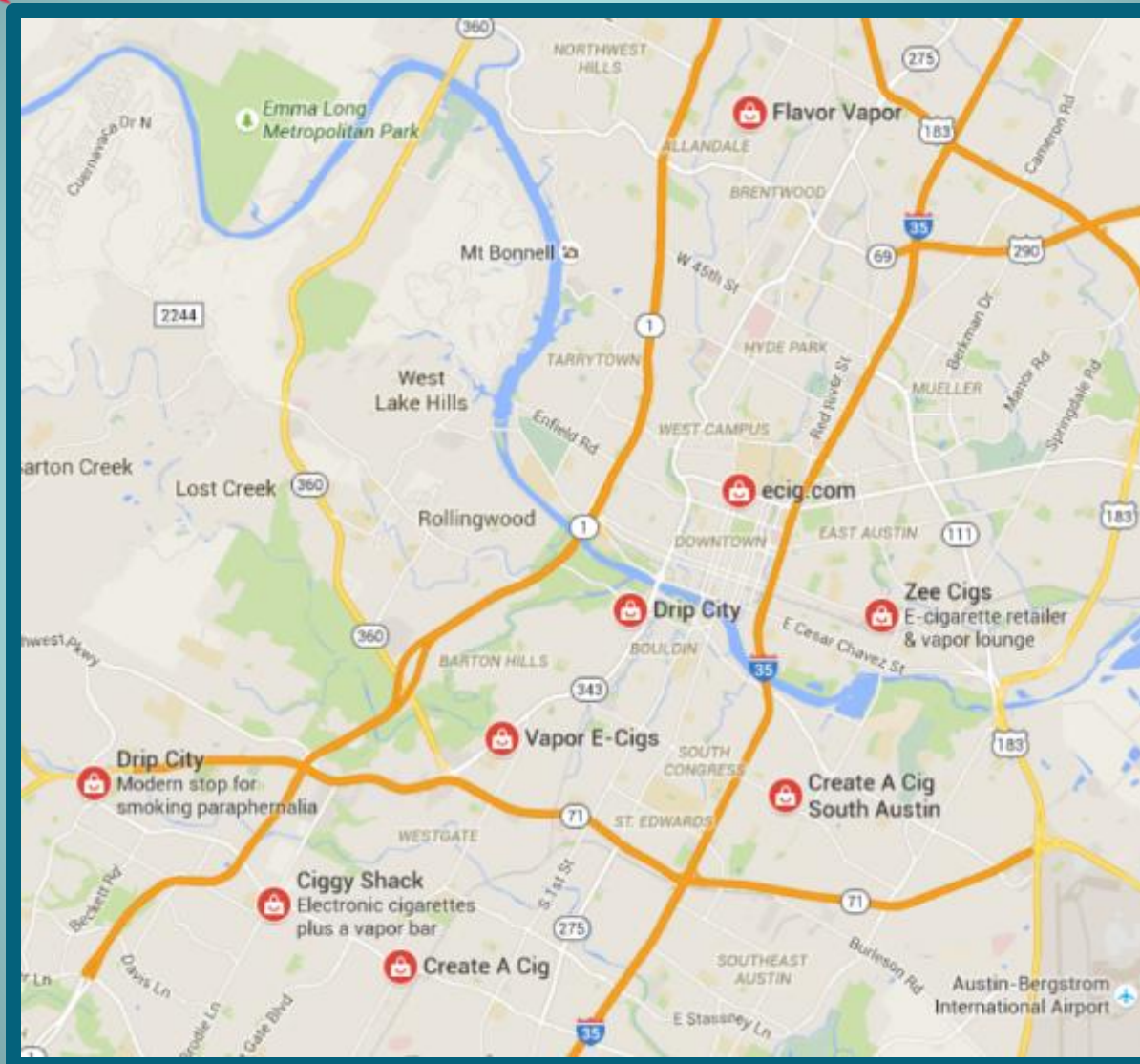
Vape shops — those small stores selling electronic cigarettes and nicotine-laced liquid — are springing up everywhere, becoming as commonplace as nail salons and dry cleaners in many retail centers.

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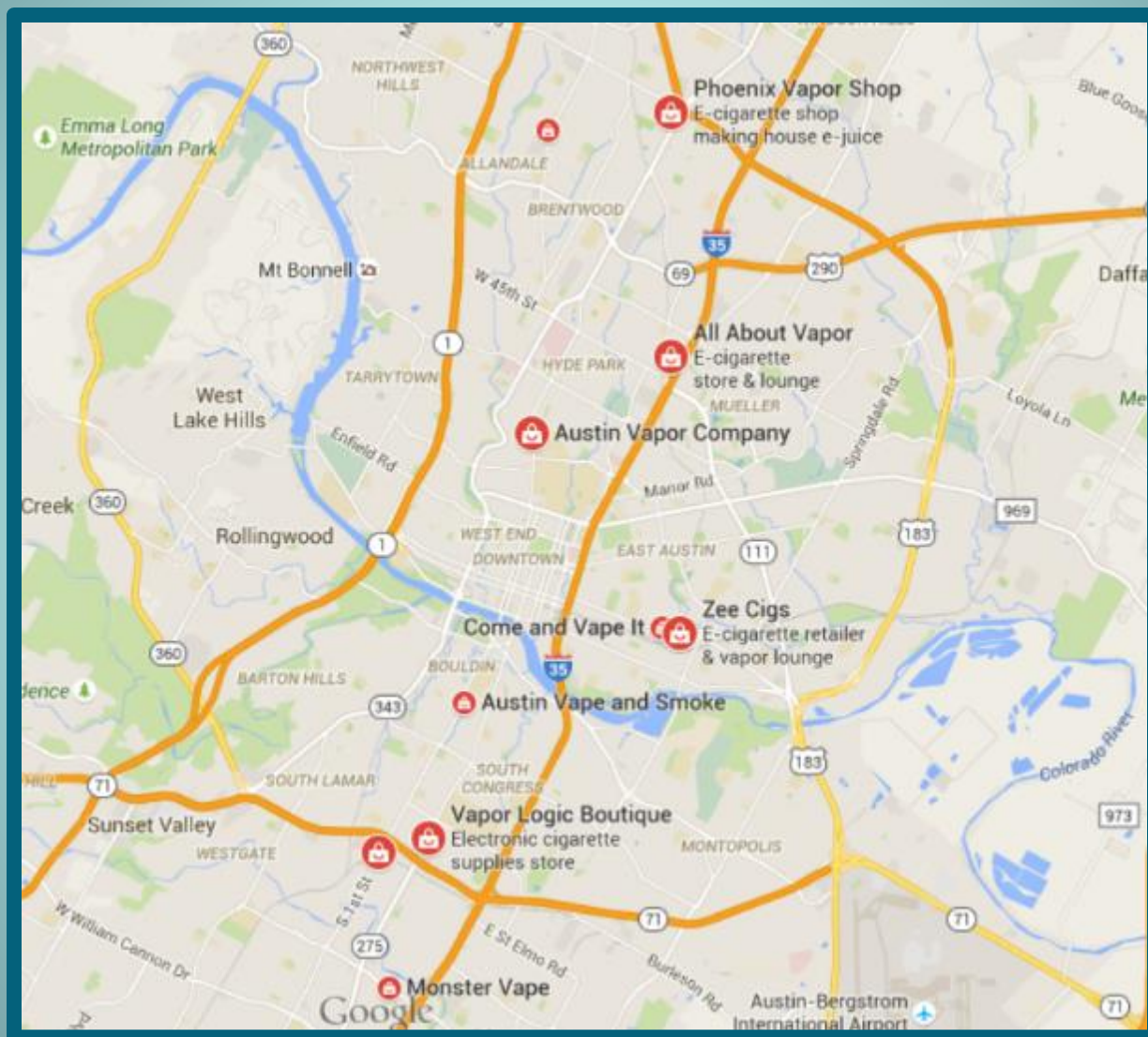
Often dubbed a "smarter alternative to smoking," e-cigarettes have a battery-powered heating cartridge that vaporizes the flavored liquid, producing inhalable vapor. E-cigs aren't federally regulated yet, but the Food and Drug Administration has proposed rules to ban their sale to minors and require ingredient

“If they haven’t already, vape shops are coming soon to a strip center near you.”





Google Maps – search results for “E-cig Austin, Texas”



Google Maps – search results for “Vape Austin, Texas”



2<sup>ND</sup> EDITION  
**VAP**EVENT

PARIS INTERNATIONAL  
VAPE TRADE SHOW

**11 - 12**

**SEPTEMBER 2016**

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**100% B2B TRADE SHOW**

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# E-Cigs 101

**Smoke** - the gaseous products of burning materials especially of organic origin made visible by the presence of small particles of carbon

**Vapor** - diffused matter suspended floating in the air and impairing its transparency

# E-Cigs 101

**Smokeless non-tobacco cigarette**  
US 3200819 A

**ABSTRACT** [available in](#)

**IMAGES** (1)



Publication number US3200819 A  
Publication type Grant  
Publication date Aug 17, 1965  
Filing date Apr 17, 1963  
Priority date  Apr 17, 1963  
Inventors [Gilbert Herbert A](#)  
Original Assignee [Gilbert Herbert A](#)  
Export Citation [BIBTeX](#), [EndNote](#), [RefMan](#)  
[Patent Citations](#) (9), [Referenced by](#) (115), [Classifications](#) (9)  
External Links: [USPTO](#), [USPTO Assignment](#), [Espacenet](#)

**DESCRIPTION** (OCR text may contain errors)

Aug. 17, 1965 H. A. GILBERT SMOKELESS NON-TOBACCO CIGARETTE

**CLAIMS** [available in](#)

“Gilbert said in 2013 that today's electric cigarettes follow the basic design set forth in his original patent.”

*The Economist*. “A Case of the Vapors” (17 March 2014).

# E-Cigs 101

## Hon Lik (Han Li)

**Native name** 韩力

**Born** September 26, 1951 (age 63)  
[Shenyang](#), [Liaoning](#), China

**Nationality** Chinese

**Known for** Inventing the [electronic cigarette](#)



Wikimedia Commons: Jodanw22 at English Wikipedia



# E-Cigs 101



Wikimedia Commons: FDA

# E-Cigs 101

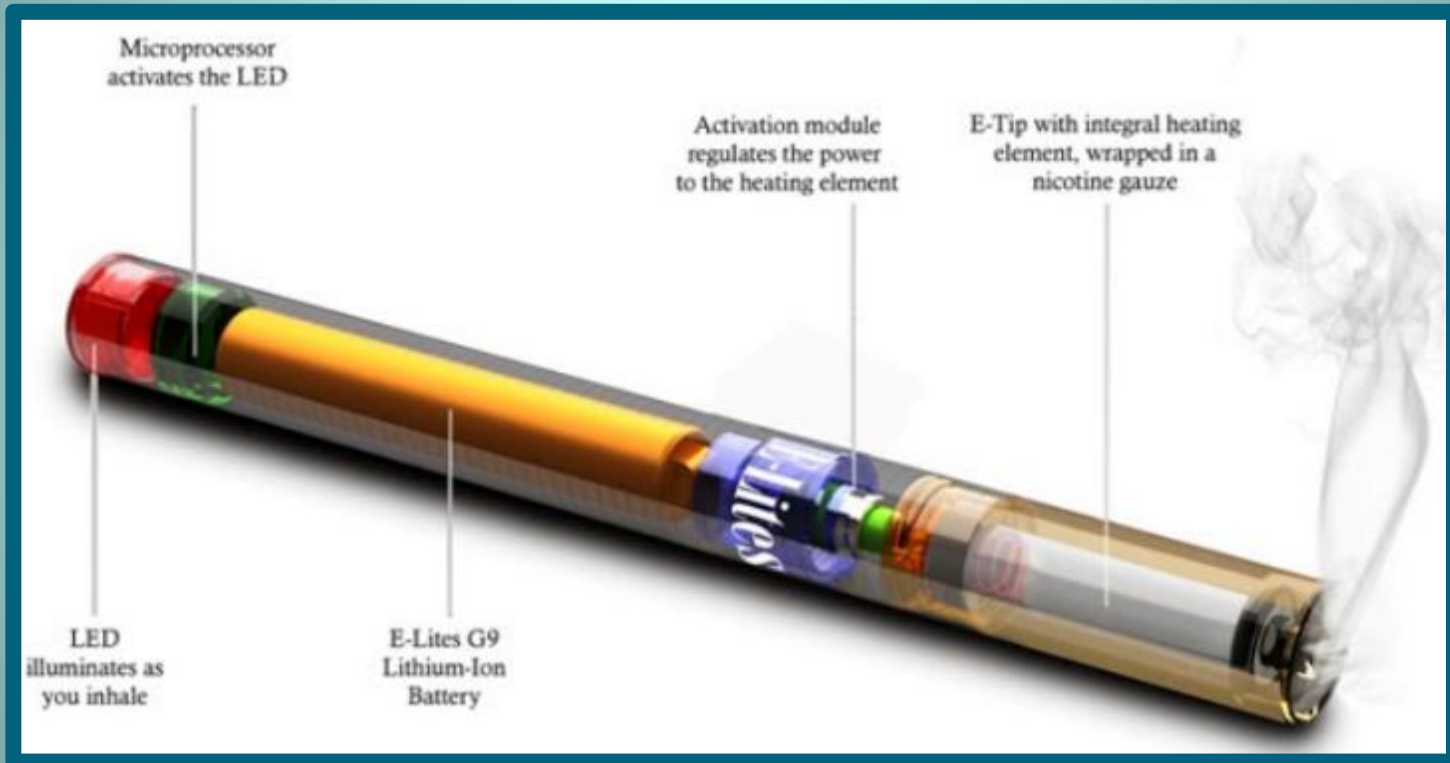


Image courtesy Josh Martin

# E-Cigs 101



Wikimedia Commons: Witzman



# E-Cigs 101



[The-best-electronic-cigarette-review.com](http://The-best-electronic-cigarette-review.com)

# E-Cigs 101



Search blog



## The Oxford Dictionaries Word of the Year is... vape

Author

[Oxford Dictionaries](#)

Published

17 November 2014

<http://blog.oxforddictionaries.com/2014/11/oxford-dictionaries-word-year-vape/>

# E-Cigs 101



Wikimedia Commons: Ludor



# E-Cigs 101



Wikimedia Commons: Atamari

# E-Cigs 101



YouTube image from “VapeBlast 2014 – Cloud Competition Finals”

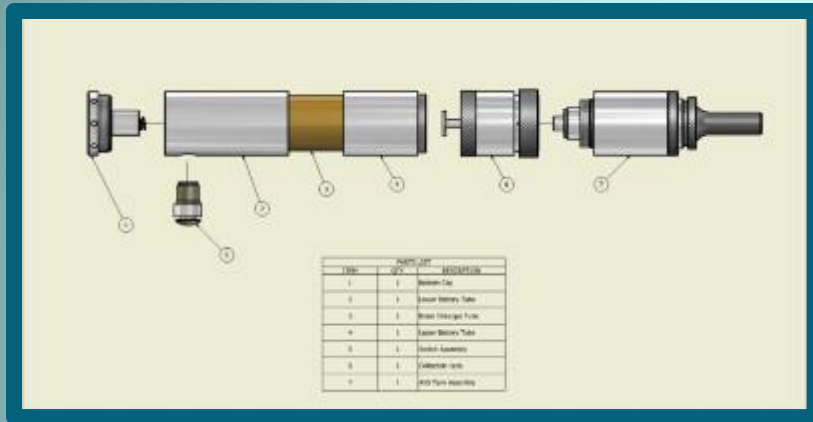
# E-Cigs 101



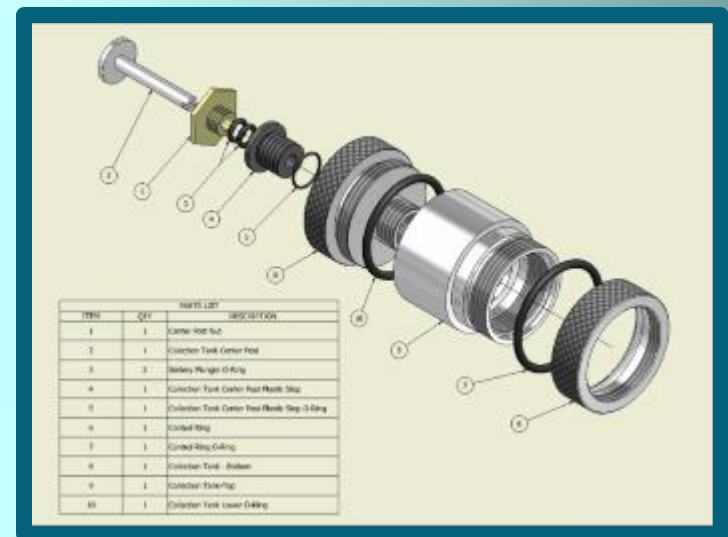
YouTube image from “Best Smoke Trick Vines”



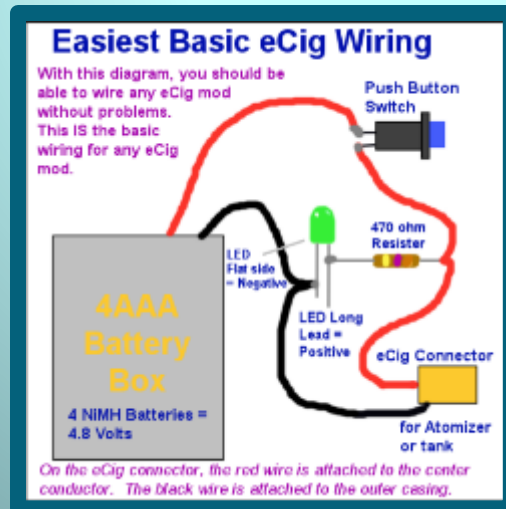
# E-Cigs 101



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*What's In Store*

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“If they haven’t already, vape shops are coming soon to a strip center near you.”







Wikimedia Commons: Daniel Schwen





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**HEALTHY  
CHICAGO**

CHICAGO DEPARTMENT OF PUBLIC HEALTH



## Supporting Information Facts

### Department:

Public Health  
Tobacco Prevention

### Programs & Initiatives:

Consumer Protection



41



5



0



## Clean Indoor Air Ordinance (No Smoking: Including E-Cigarettes)

Chicago has had its own **Clean Indoor Air Ordinance** since 1988, and this law has been strengthened over the years to better protect the health of all Chicagoans, as well as visitors to our city.

In 2014, the *Chicago Clean Indoor Air Act* was updated to include e-cigarettes in the law. Chicago was the first of the 20 largest U.S. cities to propose legislation to include e-cigarettes in their clean indoor air law.



# History of Tobacco Use



From Anthony Chute's pamphlet "Tabaco" - 1595



# Tobacco

- *Nicotiana spp.* *N. tabacum*
- Introduced to Columbus by the natives of Hispaniola
- In 1560, Jean Nicot de Villemain brought tobacco seeds and leaves to the French court as a "wonder drug"

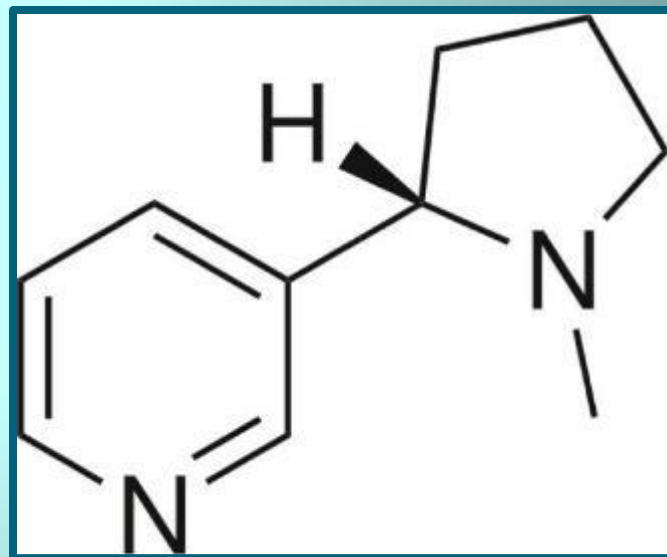


# Nightshade Family (Solanaceae)



# Nicotine

- Chemically isolated in 1828 – considered a poison
- Acts as a CNS Stimulant
- Can act as a Sedative



# Medicinal uses

- The primary therapeutic use of nicotine is in treating nicotine dependence in order to eliminate smoking with the damage it does to health.
  - Controlled levels of nicotine are given to patients through gums, dermal patches, lozenges, inhalers or nasal sprays in an effort to wean them off their dependence.
- Currently being studied as a treatment for Parkinson's, schizophrenia and other neurological diseases.

# Use as an Insecticide

- ...by the late 17th century, it was used not only for smoking but also as an insecticide. After World War II, over 2,500 tons of nicotine insecticide (waste from the tobacco industry) were used worldwide, but by the 1980's the use of nicotine insecticide had declined below 200 tons.

Ujváry, István (1999). "Nicotine and Other Insecticidal Alkaloids".



# Nicotine - Regulatory Status

EPA Hazardous Waste Code - P075

Acute Hazardous Waste

- Discarded commercial chemical products
- Off-specification species
- Container residues
- Spill residues





**U.S. Food and Drug Administration**

Protecting and Promoting *Your* Health

## **A Public Workshop – Electronic Cigarettes and the Public Health**

### **Electronic Cigarettes and the Public Health: A Public Workshop**

We would like to thank those of you who attended the workshop in person or viewed the live webcast. The archived webcast and verbatim transcript will be posted here as soon as they become available. Information about upcoming CTP workshops will be posted on our "[Meetings and Conference](#)" page as dates, times and locations are finalized.

# Toxicology

- The LD<sub>50</sub> of nicotine is 50 mg/kg for rats and 3.34 mg/kg for mice. 30–60 mg (0.5–1.0 mg/kg) can be a lethal dosage for adult humans and 0.1 mg/kg for children.<sup>1</sup>
- Spilling an extremely high concentration of nicotine onto the skin can cause intoxication or even death, since nicotine readily passes into the bloodstream following dermal contact.<sup>2</sup>

<sup>1</sup> IPCS' INCHEM.org

<sup>2</sup> Lockhart LP (1933). "Nicotine poisoning". *Br Med J* 1 (3762): 246–7

# Toxicology

- In 1851, the Belgian chemist Jean Stas documented the use of tobacco extract as a murder poison. A Belgian count had poisoned his brother-in-law with tobacco leaf extract in order to acquire some urgently needed money. This was the first exact proof of alkaloids in forensic medicine.

"Back to the roots of modern analytical toxicology: Jean Servais Stas and the Bocarmé murder case". *Drug Testing and Analysis* **1** (4): 153–5.





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“If they haven’t already, vape shops are coming soon to a strip center near you.”

# Where can you find a Vape Shop?





# Where can you find a Vape Shop?



# Where can you find a Vape Shop?





# Where can you purchase products?



Gas station display

# Where can you purchase products?



Pharmacy display

# Where can you purchase products?



Flea markets



# Where can you purchase products?





# Where can you purchase products?



# Where can you purchase products?







# Vape and.....





# Vape and.....



# Vape and.....



# Tier One – Strictly Retail





# Tier One – Strictly Retail





# Tier One – Strictly Retail



# Tier One – Strictly Retail



# Tier One – Strictly Retail

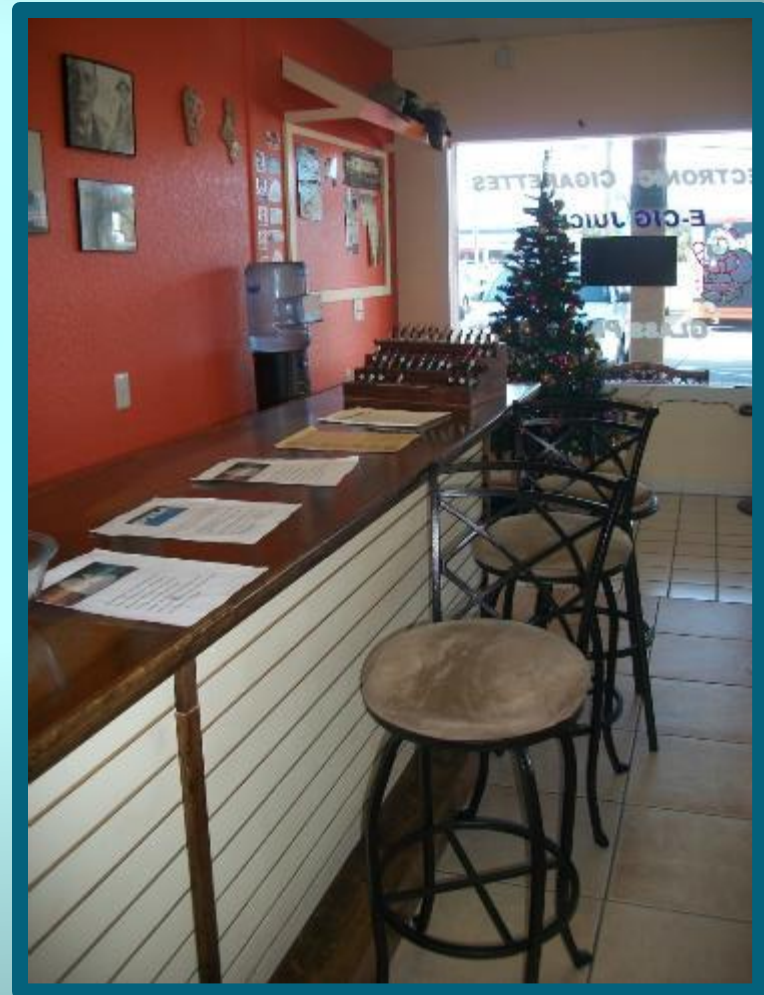
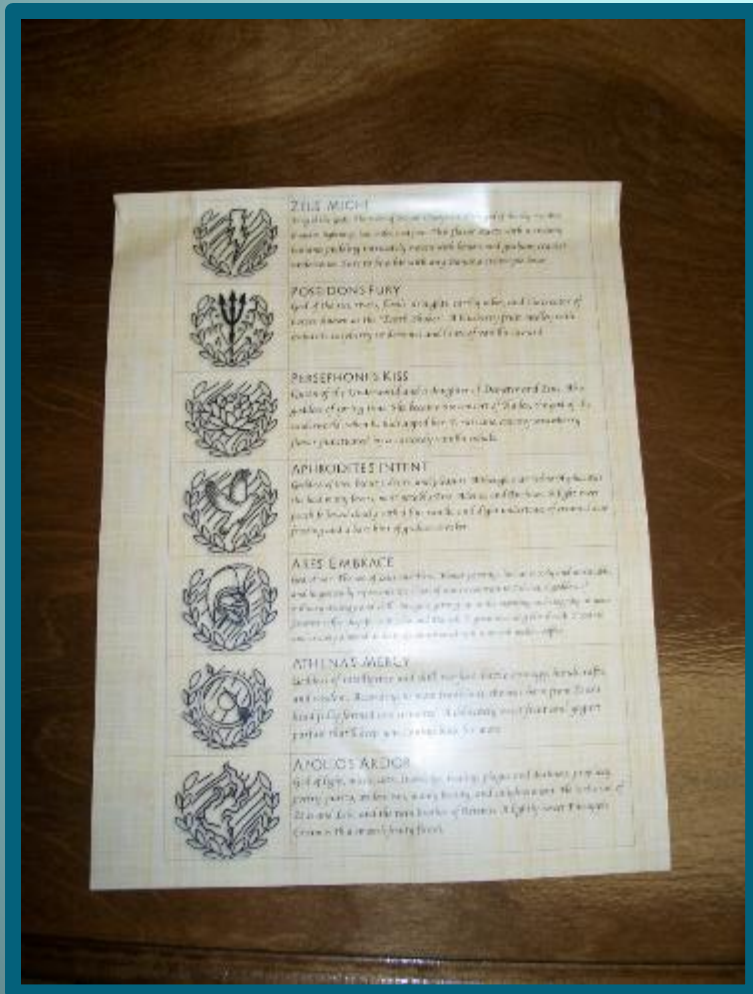




# Tier One – Strictly Retail



# Tier Two – The Lounge





# Tier Two – The Lounge





# Tier Two – The Lounge



# Tier Two – The Lounge



# Tier Three - Rebuilding





# Tier Three - Rebuilding



# Tier Three - Rebuilding



# Tier Three - Rebuilding

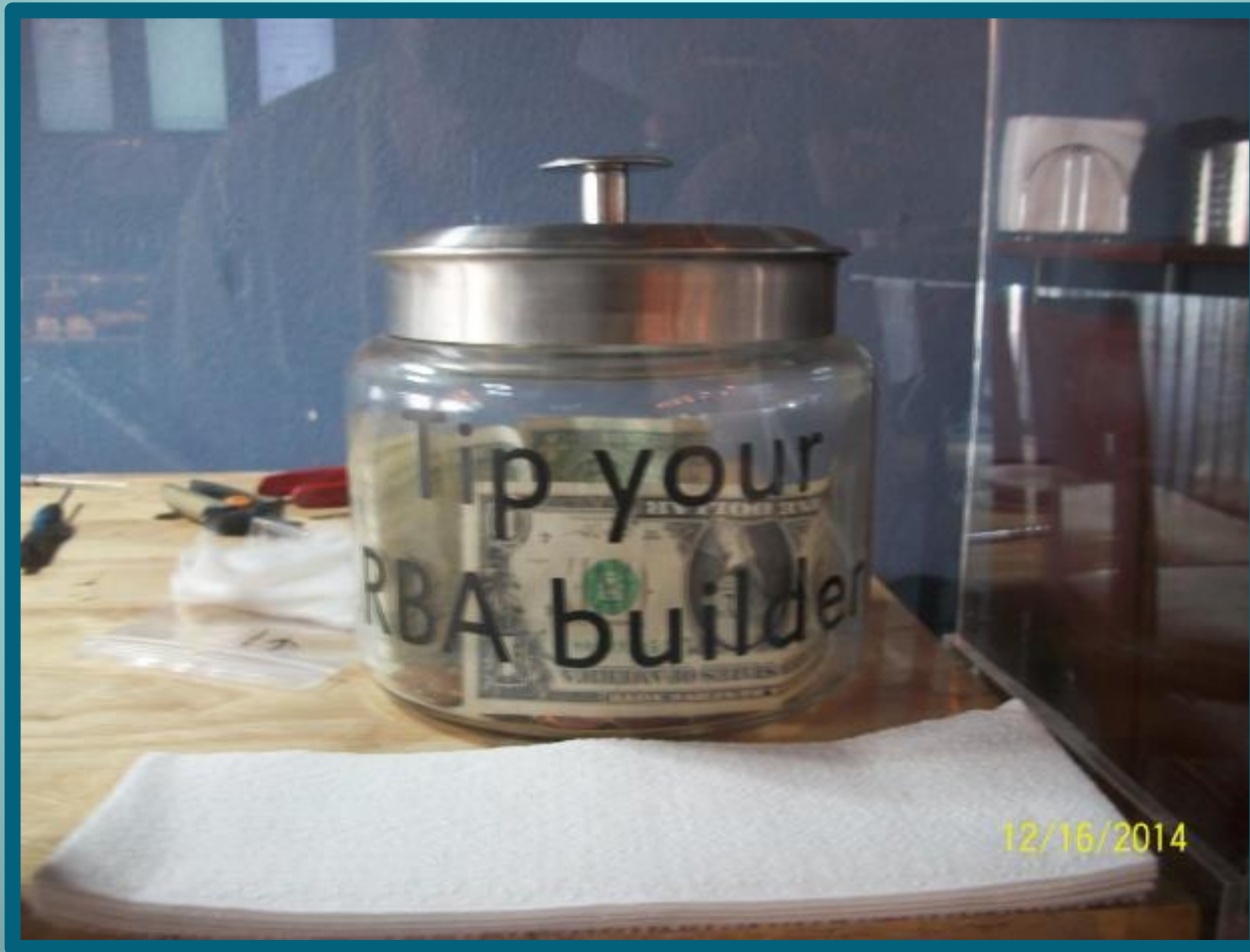




# Tier Three - Rebuilding



# Tier Three - Rebuilding



# Tier Four - Mixing





# Tier Four - Mixing



# Tier Five – Chemical Manufacturing



# Tier Five – Chemical Manufacturing





# Tier Five – Chemical Manufacturing



Image courtesy Cuttwood Vapors

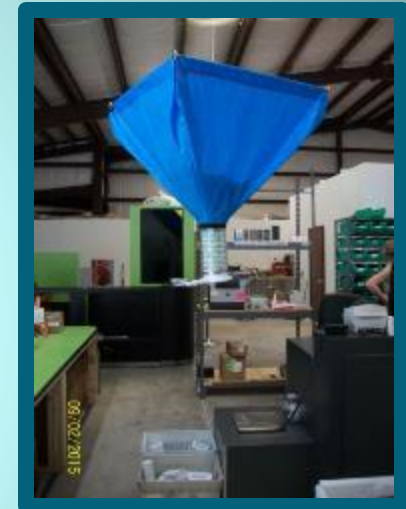
# Tier Five – Chemical Manufacturing



Image courtesy Cuttwood Vapors

Contract Manufacturers

# Tier Five and a Half - Distribution





# Tier Five and a Half - Distribution



# Tier Five and a Half - Distribution



# Waste Streams of Concern

1. Empty P-listed containers
  - Nicotine (used in mixing)
  - E-Liquid/E-Juice
  - Devices
    - Disposable
    - Tank/Cartomizer/Mod



# Waste Streams of Concern

- “Therefore, if the container that held P-listed pharmaceutical is not triple rinsed, or cleaned by another method that has been demonstrated to achieve equivalent removal, or had the inner liner removed, the container is not considered RCRA empty” even though the pharmaceutical may be fully dispensed. If the container is not “RCRA empty,” then residues are regulated as acute hazardous waste.”

USEPA Nov. 4, 2011 Memorandum

# Waste Streams of Concern

- 2. Coils with RCRA metals
  - Spent coils
  - Waste devices with coils
  - Scrap from rebuilding

# Waste Streams of Concern

**Kanthal A1** has a higher maximum operating temperature of 1400°C compared to 1300°C for Kanthal D. It also has a slightly higher tensile strength. Kanthal A1 has high resistivity, better wet corrosion resistance, and higher hot and creep strength. One of the main advantages of Kanthal A1 over Kanthal D is the fact that it does not easily oxidize. **It is excellent for making your own coils.**

## Specifications:

**22% chromium (Cr)**, 5.8% aluminum (Al), Iron (Fe) balance

Density: 7.1 g/cubic cm

Tensile strength: 680 n/mm<sup>2</sup>

Melting Temperature: 1500°C (2732°F)

Maximum Operating Temperature: 1400°C (2550°F)

Density: 0.256 lbs/cubic in.

Specific heat capacity @ 68°F: 0.11 Btu/lb°F



# Waste Streams of Concern

Waste Management 39 (2015) 57–62

Contents lists available at ScienceDirect

**Waste Management**

journal homepage: [www.elsevier.com/locate/wasman](http://www.elsevier.com/locate/wasman)

**Hazardous waste status of discarded electronic cigarettes**

Max J. Krause, Timothy G. Townsend \*

Department of Environmental Engineering Sciences, University of Florida, 220 Black Hall, Gainesville, FL 32611, USA

**ARTICLE INFO**

**Article history:**  
Received 3 October 2014  
Accepted 3 February 2015  
Available online 4 March 2015

**Keywords:**  
e-cigarette  
WEEE  
e-waste  
Lead  
Hazardous waste  
Nicotine

**ABSTRACT**

The potential for disposable electronic cigarettes (e-cigarettes) to be classified as hazardous waste was investigated. The Toxicity Characteristic Leaching Procedure (TCLP) was performed on 23 disposable e-cigarettes in a preliminary survey of metal leaching. Based on these results, four e-cigarette products were selected for replicate analysis by TCLP and the California Waste Extraction Test (WET). Lead was measured in leachate as high as 50 mg/L by WET and 40 mg/L by TCLP. Regulatory thresholds were exceeded by two of 15 products tested in total. Therefore, some e-cigarettes would be toxicity characteristic (TC) hazardous waste but a majority would not. When disposed in the unused form, e-cigarettes containing nicotine juice would be commercial chemical products (CCP) and would, in the United States (US), be considered a listed hazardous waste (P075). While household waste is exempt from hazardous waste regulation, there are many instances in which such waste would be subject to regulation. Manufacturers and retailers with unused or expired e-cigarettes or nicotine juice solution would be required to manage these as hazardous waste upon disposal. Current regulations and policies regarding the availability of nicotine-containing e-cigarettes worldwide were reviewed. Despite their small size, disposable e-cigarettes are consumed and discarded much more quickly than typical electronics, which may become a growing concern for waste managers.

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# Waste Streams of Concern

3. Clean-up materials from spills

# Waste Streams of Concern

4. Fabric wicks from rebuilding



# Waste Streams of Concern

## 5. Mere wiping

# Waste Streams of Concern

## 6. Spent Batteries

- NiMH,
- LiMn (manganese)
- LiMnO<sub>2</sub>
- others



## Electronic cigarettes, vaping devices

Battery-powered E-cigarettes, vaporizers, vape pens, atomizers, electronic nicotine delivery systems

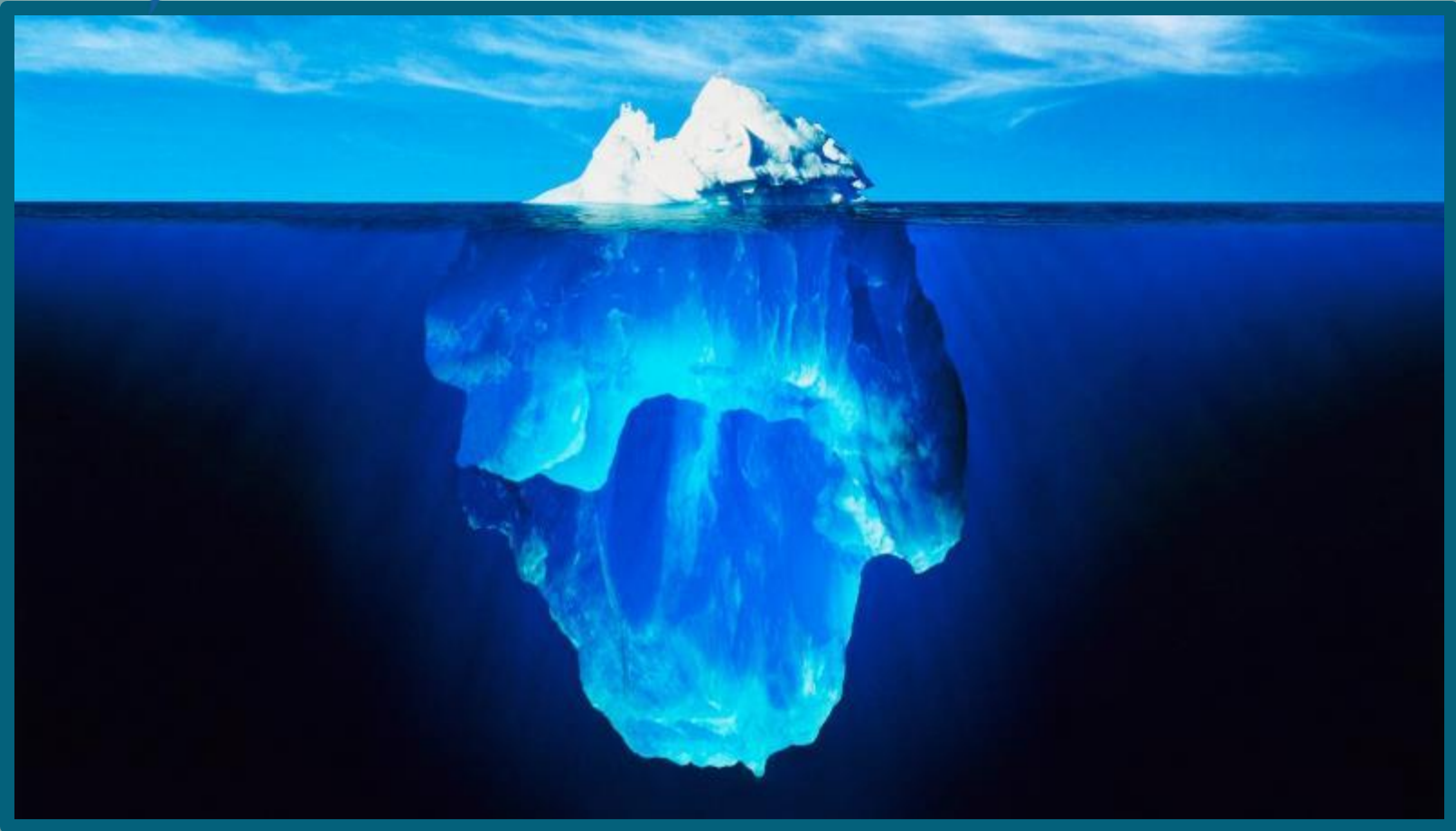


These devices are battery powered and have a heating element that vaporizes liquid (that may or may not contain nicotine). These devices are prohibited in checked baggage by international regulations and the FAA strongly recommends that these devices only be carried in the aircraft cabin (in carry-on baggage or on your person). Please also check your airline's policy as they may place additional restrictions on these devices. When a carry-on bag is checked at the gate or planeside, all electronic cigarette and vaping devices, along with any spare lithium batteries, must be removed from the bag and kept with the passenger in the aircraft cabin.

**WARNING:** Lithium batteries must be handled with extreme care. Lithium batteries must be compatible with the device. Installed batteries must not be more powerful than what the device is designed for. Homemade "modified" battery packs—whether installed in a device or carried as a spare—are forbidden on aircraft. Spare (uninstalled) lithium batteries must be placed in carry-on baggage. See separate entry in this table for spare lithium batteries.

[http://www.faa.gov/about/initiatives/hazmat\\_safety/](http://www.faa.gov/about/initiatives/hazmat_safety/)





[Baldscientist.wordpress.com](http://Baldscientist.wordpress.com)

## Ultimate Vaping Glossary & Resources

 Like  +1  Tweet

Here are some of our useful resources as well as some other awesome websites, blogs or youtubers that share their knowledge of vaping and e cigs. Be sure to check them out!

[Click here to jump to the Vaping Glossary](#)

## TOP 6 TOOLS TO REBUILD YOUR FIRST ATOMIZER COIL



[www.BestClearomizer.com](http://www.BestClearomizer.com)


Learning how to rebuild your own atomizer coils is a must for any serious vaper. It allows you to really learn the ins and outs of your vaping devices, and gives you the power to wrap coils perfectly suited to your preferences. And if you vape a lot, it can save you a ton of money!

The first step is to get your hands on these 6 basic tools needed to rebuild your first atomizer. Next, check out this beginner tutorial focused on getting your first rebuild done.

**Tutorial:** [bestclearomizer.com/go/coil-tutorial/](http://bestclearomizer.com/go/coil-tutorial/)

Remember, this is a beginner build. There are more tools and more techniques for more advanced builds, but the goal is to get the first one done. With that said, let's get started!


**1 Needle Nose Pliers** - Any type of pliers will work, but needle nose pliers make it easier to tweak your coil.   
Don't have one? [bestclearomizer.com/go/pliers/](http://bestclearomizer.com/go/pliers/)

**2 Small Screw Driver** - A small screw driver, usually a phillips head that can be used to unscrew the posts on your atomizer.   
Don't have one? [bestclearomizer.com/go/sd/](http://bestclearomizer.com/go/sd/)

**3 Nail Clippers** - Any pair of your standard nail clippers. These will be used to trim your wick and coil.   
Don't have one? [bestclearomizer.com/go/clips/](http://bestclearomizer.com/go/clips/)

**4 Nail or Pin** - A small pin or nail will help a lot when you are wrapping your coil around your wick.   
Don't have one? [bestclearomizer.com/go/pins/](http://bestclearomizer.com/go/pins/)

**5 Kanthal Wire** - You'll need a piece of Kanthal wire. Wire comes in different gauges, a 32 gauge is a good place to start.   
Don't have any? [bestclearomizer.com/go/kanthal/](http://bestclearomizer.com/go/kanthal/)

**6 Silica Wick** - Most vapers choose either silica or cotton wicks, but for your first rebuild, we recommend silica.   
Don't have any? [bestclearomizer.com/go/silica/](http://bestclearomizer.com/go/silica/)

[www.BestClearomizer.com](http://www.BestClearomizer.com)

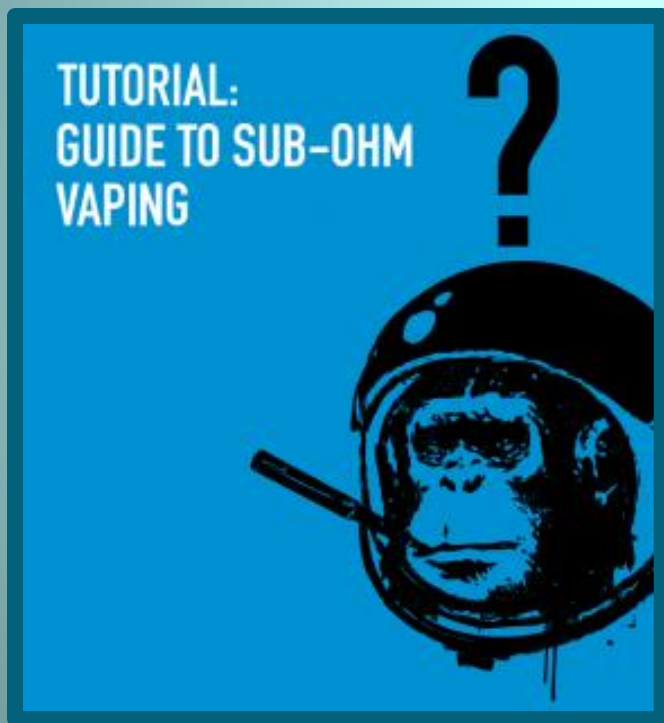
YouTube

how to build an electronic cigarette





# Hot Topic Spring 2015



“... a complex and often controversial topic within the vaping community.”

“... to create more vapor and flavor”

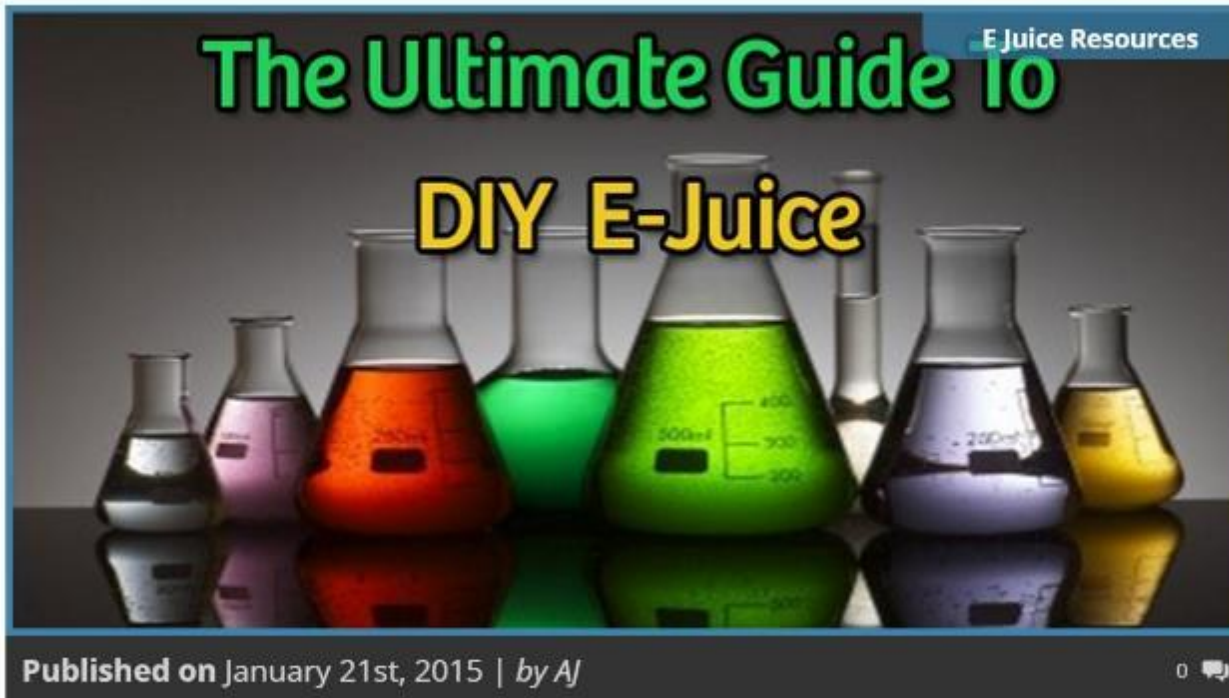
...it is absolutely critical that you NEVER EXCEED YOUR BATTERIES AMP LIMIT..”

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## Ultimate Guide to DIY E-Juice

# DIY E-Juice



**100mg NICOTINE  
SOLUTION Sale  
Extended**

Liter - \$44.99

Gallon - \$169.99

**Buy Now!**





# DIY E-Juice

**Nicotine Substitute** (Use this Option if You Want the Nicotine “Burn” without the Nicotine Intake) Contains: 100% Natural Capsicum Blend.

Option. None

Low - .05ml

Medium - .10ml

High - .15ml

**Caffeine Energy Blend** - (Adds Some Sweetness) Not Recommended For People Sensitive to Caffeine

None

05 mg Low - (Delivers Approximately .4 mg Per Hit) +\$1.00

10 mg Medium - (Delivers Approximately .8 mg Per Hit) +\$2.00

20 mg High - (Delivers Approximately 1.6 mg Per Hit) +\$3.00

40 mg Super - (Delivers Approximately 3.2 mg Per Hit) +\$4.00

80 mg Hyper - (Delivers Approximately 6.4 mg Per Hit) +\$5.00

100 mg Extreme - (Delivers Approximately 8.0 mg Per Hit) +\$6.00

# DIY E-Juice

**Ginkgo Biloba Leaf Extract (.81 mL Per Ounce) +\$5.00**

**Ginseng (.11 mL Per Ounce) +\$5.00**

**Green Tea Extract (.07 mL Per Ounce) +\$5.00**

**Milk Thistle (.06 mL Per Ounce) +\$5.00**

**Papaya Leaf Extract (.15 mL Per Ounce) +\$5.00**

**Vitamin B12 (.29 mL Per Ounce) +\$5.00**

**Vitamin C (.66 mL Per Ounce) +\$5.00**

# “sole active ingredient”

- “EPA defines active ingredient as a chemically active ingredient that **performs the primary function of the product**” -[RO 11348]
- “Fillers, solvents, surfactants, propellants, colorants, preservatives, etc. are considered to be inert, nonactive ingredients.” -McCoy’s RCRA Unraveled 2014, p. 129.



## Hazardous Waste Status of E-Cigarettes Under RCRA



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

MAY 08 2015

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

Daniel K. DeWitt  
Warner, Norcross & Judd LLP  
900 Fifth Third Center  
111 Lyon Street, N.W.  
Grand Rapids, MI 49503-2487

Dear Mr. DeWitt:

Thank you for your letter of March 12, 2014, requesting EPA's determination regarding the hazardous waste status of e-cigarettes under the Resource Conservation and Recovery Act (RCRA). After reviewing your letter, the Agency has concluded that because e-cigarettes include cartridges that are containers of a commercial chemical product, specifically nicotine, e-cigarettes therefore may be regulated as acute hazardous waste P075 when disposed.

Nicotine as the Sole Active Ingredient of E-Liquids

RCRA Online Number 14850

## Hazardous Waste Status of E-Cigarettes Under RCRA

Nicotine is a commercial chemical product listed in 40 CFR 261.33(e) and is an acute hazardous waste (EPA waste code P075) when disposed.

The EPA has previously interpreted “sole active ingredient” to mean that the active ingredient is the only chemically active component that performs the function of the product.<sup>1</sup>

<sup>1</sup> The EPA also finds flavorings and sweeteners to be inert ingredients because they are not performing the function of the product.<sup>6</sup> Thus, the flavorings, propylene glycol, vegetable glycerin, and polyethylene glycol 400 are not active ingredients of the e-liquids you describe, leaving nicotine as the sole active ingredient in the e-liquid. Therefore, nicotine-containing e-liquids are considered P075 acute hazardous waste when discarded.

Other types of e-cigarettes are refilled by the user. E-cigarette cartridges are considered containers of nicotine (RCRA waste code P075), regardless of the style or design of the e-cigarette and regardless of whether the cartridge is integral to or detachable from the e-cigarette.

RCRA Online Number 14850

## Hazardous Waste Status of E-Cigarettes Under RCRA

### Household Disposal

E-cigarettes that are disposed of by consumers at their residences are considered exempt household hazardous waste under § 261.4(b)(1) and are not subject to regulation as hazardous waste under the federal RCRA hazardous waste regulations. Those who manufacture or sell e-cigarettes out of their residence, however, are not eligible for the household hazardous waste exemption and therefore the e-liquids and e-cigarettes are subject to hazardous waste regulation when disposed.

RCRA Online Number 14850





## Landfill / Recycling Solid Waste



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### A to Z Recycling & Disposal Guide



*How do I get rid of it?*  
The **A to Z Guide** for  
Recycling & Disposal in Pinellas County

#### A to Z Guide by Item:

Click the letter the item starts with (such as C for cell phone),  
then click on the item:

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)



## The A to Z Guide for Recycling and Disposal

*How Do I Get Rid Of It?*

### E-Cigarettes

*used or unused*

**Caution: Hazardous Waste**  
**DO NOT** dispose in regular trash.

E-cigarettes can contain the following hazardous components:

- Chromium coil wire
- Lithium-ion battery
- LED lamp
- E-liquid / E-juice (often contains nicotine)
- Empty E-Liquid / E-Juice Containers (if contained nicotine)

1. **Drop-off** at a Pinellas County [mobile collection](#) or the [HEC<sub>3</sub> facility](#) for recycling (free for residents). Businesses see #2 below.
  - a) Do not separate the E-cigarette parts; bring as one piece.
2. **Businesses** can drop off unused/unsellable E-cigarettes (for a [fee](#)) at a Pinellas County [mobile collection](#) or the monthly [EnviroBusiness Day](#) (check link for dates) event at the HEC<sub>3</sub> facility. Another option is to contact a [Electronics Recycling and Disposal Company](#) directly to request pickup (fee varies):

## Applicability of RCRA Regulations to Nicotine Reclamation Process



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

MAY 08 2015

OFFICE OF  
SOLID WASTE AND  
EMERGENCY RESPONSE

Scott DeMuth  
Vice President, Business Development  
g<sup>2</sup>revolution, LLC  
8585 Pyott Rd.  
Suite 100  
Lake in the Hills, IL 60156

Dear Mr. DeMuth:

Thank you for your letter of October 17, 2014, requesting an opinion from the U.S. Environmental Protection Agency (EPA) on the applicability of federal Resource Conservation and Recovery Act (RCRA) regulations to your nicotine reclamation process (Knightshade™).

To summarize your letter, retailers send to your company unused and unsaleable nicotine-containing products, including gum, lozenges, patches and e-cigarettes. Your company extracts the nicotine and then sells the extracted nicotine to another company that purifies the nicotine for sale to manufacturers of new nicotine-containing products.

RCRA Online Number 14851



## Applicability of RCRA Regulations to Nicotine Reclamation Process

EPA also codified in § 260.43(g) previous guidance on what constitutes “legitimate” recycling, and specified the four factors that must be met for recycling to be legitimate. The four legitimacy factors are as follows:

Waste streams Generated During the Reclamation Process

RCRA Online Number 14851



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“Curiouser and curiouser!”

-Lewis Carroll,  
*Alice’s Adventures in Wonderland*