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Exploding E-Cigarettes: A Battery Safety Issue

SAURABH SAXENA^{ID}, LINGXI KONG^{ID}, AND MICHAEL G. PECHT^{ID}, (Fellow, IEEE)

Center for Advanced Life Cycle Engineering, Department of Mechanical Engineering, University of Maryland College Park, College Park, MD 20742, USA

Corresponding author: Saurabh Saxena (saxenas@umd.edu)

ABSTRACT E-cigarettes have become popular as an alternative to traditional tobacco products. However, the safety of e-cigarettes is a significant issue, as there have been numerous incidents of Li-ion battery fires and explosions resulting in bodily injury and property damage. This paper presents a comprehensive review of publicly reported e-cigarette fire and explosion incidents, and then, identifies and discusses the key concerns, causes, and remedies.

INDEX TERMS Lithium-ion battery, e-cigarette explosion, thermal runaway, batteries, fires, safety.

I. INTRODUCTION

On February 13, 2016, Dan Walker, a 20-year-old from Staffordshire, U.K., had an e-cigarette battery explode in his trousers [1]. He was treated for second and third degree burns on his thigh. The battery exploded in the pocket of his jogging trousers when he was out shopping with his friends. He reacted quickly and pulled down his trousers to escape from the flames. The damage required skin grafting surgeries leaving Mr. Walker traumatized for life [2] (Figure 1).

Electronic cigarettes, referred to as “e-cigarettes,” “e-cigs,” “cigalikes,” “e-hookahs,” “mods,” “vape pens,” “vapes,” “vaporizers,” “e-pipes,” and “tank systems” and collectively described as electronic nicotine delivery systems (ENDS) [3], [4], include a diverse group of battery-powered devices that allow users to inhale an aerosol, which typically contains nicotine, flavorings, and other additives [3], [5]. E-cigarettes were first commercialized in 2004 in China and were introduced into European and American markets in 2006 and 2007, respectively [6]–[8]. As of 2014, 90% of all e-cigarettes come from supply chains centered in China [9]. As per Euromonitor International, the U.S. accounted for about 43% of the \$8 billion market for these devices in 2015 [10].

E-cigarettes come in various designs and forms, but generally consist of a cartridge or E-liquid tank containing a liquid solution, an atomizer (the heating element), and the battery (power source) as shown in Figure 2. The liquid solution is typically comprised of propylene glycol, glycerin, flavoring, and varying levels of nicotine. When the user inhales, often called “vaping”, the airflow activates a flow trigger, and a heating element energized by a battery [most often a lithium-ion (Li-ion) battery] vaporizes the solution in the cartridge into mist that the user inhales.

The increased usage of e-cigarettes has compelled government and health organizations to study the health risks



FIGURE 1. Severely burnt areas on the victim’s thigh [credit: SWNS], used with permission.

associated with not only the known harmful health effects of nicotine, but also the potentially harmful effects of heated, aerosolized constituents of e-cigarette liquids, including solvents, flavorants, and toxicants [3]. However, battery fire and explosion incidents associated with the Li-ion batteries are an additional and unexpected risk. Numerous Li-ion battery fire incidents have been reported in applications ranging from aviation to electric vehicles, hoverboards, smartphones, and e-cigarettes [11]–[17]. In all of these incidents, the Li-ion battery was identified as the cause of the fire. Battery explosions can also be fatal and cause extensive property damage.

This paper reviews the publicly available data on e-cigarette fire/explosion incidents. The possible causes leading to e-cigarette explosion and the underlying thermal runaway process are then discussed and analyzed. Section II describes e-cigarette fire incidents related to Li-ion batteries. Section III discusses the causes of Li-ion battery

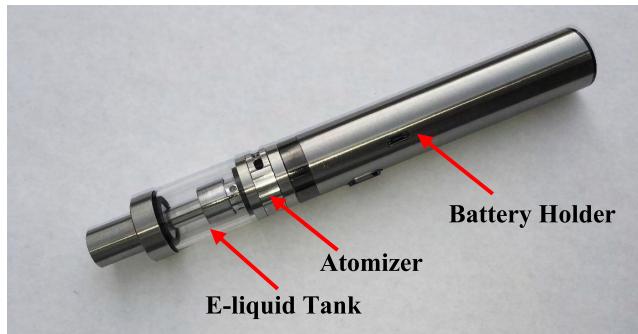


FIGURE 2. E-cigarette components.

fires/explosions in e-cigarettes. Section IV presents a discussion on the usage of rewrapped and counterfeit batteries in e-cigarettes. Conclusions are summarized in Section V. Appendix presents reported e-cigarette incidents from a blog site [15].

II. E-CIGARETTE FIRES AND EXPLOSIONS

With the increased usage of e-cigarettes, there has been a corresponding increase in battery fires and explosions and subsequent injuries [2], [16], [18]. For example, an Idaho user was seriously injured when an e-cigarette exploded in his mouth [19]. He shared photos of the damaged e-cigarette battery on Facebook and provided the following narrative [20]:

“I’ve been doing this {vaping} for about a year now and assure you I did not do anything I wasn’t supposed to (battery was in right, always had the shop put it together when I first bought it and add things and maintenance it the right way while taking their advice) but it exploded in my face.”

“I’ve lost at least 7 teeth, 2nd degree burns to face and neck and have been pulling chunks of plastic, teeth and foreign objects from mouth, throat and lips.”

Similarly, in Albany, New York, an e-cigarette device exploded in a user’s mouth, ripping a hole in his tongue, knocking out teeth, and burning his hands [21]. The user described his experience to WTEN [22]

“Like a M80 bomb went off in my mouth.”

“When I hit the button, I saw a huge yellow light. The next thing I know, I’m on the floor and my arms are paralyzed.”

And per the user’s mother, who was an eye witness, [21], [22]:

“The battery had exploded inside and everything shot out ... went into his mouth and burned everything.”

In another incident, an e-cigarette exploded in the face of a Colorado college student [23], [24], resulting in several broken bones in his face and neck, loss of his front tooth, and severe burns to his mouth [23]. His sister said doctors were not sure if her brother would be able to walk again [24].

E-cigarette fires have also been a cause of concern for the safety of cargo and passenger aircrafts. Federal Aviation Administration (FAA) has reported 191 air/airport incidents involving smoke, fire, extreme heat or explosion in lithium batteries carried as cargo or passenger baggage between March 20, 1991 and January 24, 2018 [25]. 34 of these incidents, about 18 percent, were related to e-cigarette batteries with 12 e-cigarette incidents occurring in 2017 alone. In the latest incident on December 30, 2017, a bag on the arriving baggage carousel of Boston Logan International (BOS) airport caught fire due to an e-cigarette.

In July 2017, the National Fire Data Center of the U.S. Fire Administration [16] assessed the prevalence of e-cigarette-related fire and explosion incidents, identifying 195 separate e-cigarette incidents in the U.S. between January 2009 and December 31, 2016. Thirty-eight of the incidents resulted in severe injury to an individual, requiring hospitalization for the loss of a body part, third degree burns, or facial injuries [16]. The report shows that the number of e-cigarette fires and explosions has been increasing, possibly in correlation with the increase in e-cigarette sales. Also, there has been an increase in the number of severe and moderate injuries resulting from e-cigarette explosions and fires. The report also notes the lack of regulations, codes, and laws concerning the safety of e-cigarette batteries.

Similarly, an online blog found that, from August 2009 to April 2017, at least 243 e-cigarette explosions [15]¹ allegedly occurred, with 158 resulting in personal injury. While 85 resulted in no reported injuries to people, some resulted in animal death and extensive property damage [15]. Figure 3 shows the results of the National Fire Data Center and the blog reports and outlines the “reported” operating conditions of the e-cigarette battery at the time of fire/explosion incidents.

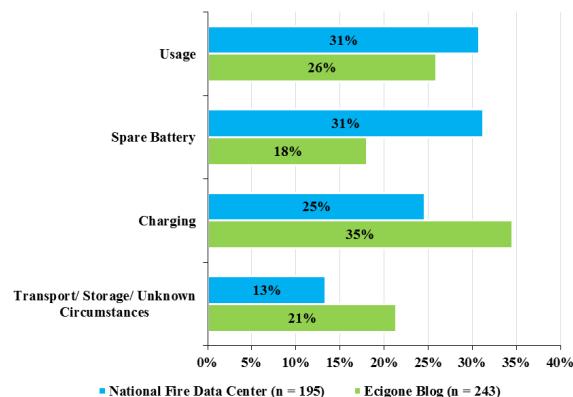


FIGURE 3. Battery operating conditions during the occurrence of e-cigarette fire incidents from two sources: National Fire Data Center (n = 195) [16] and Ecigone Blog (n = 243) [15].

As battery-related safety issues have come into prominence, the U.S. Food and Drug Administration (FDA) created a website [26] (last updated on May 30, 2017), titled “Tips to Help Avoid ‘Vape’ Battery Explosions” noting that,

¹This list only covers incidents reported in media and internet forums and hence the actual count of incidents may be significantly higher.

"You may have heard that e-cigarettes, or "vapes," can explode and seriously injure people. Although they appear rare, these explosions are dangerous. The exact causes of such incidents are not yet clear, but some evidence suggests that battery-related issues may lead to vape explosions."

III. LI-ION BATTERIES AND THERMAL RUNAWAY

Lithium-ion batteries are widely used in rechargeable-battery-based e-cigarette devices due to their high energy density and voltage levels.² Li-ion batteries used in e-cigarettes typically consist of two sheets of electrodes (anode and cathode) which are spaced apart by a separator, filled with a liquid electrolyte, wrapped into a tube (cylindrical) shape, and placed into a metal case. A tab from the anode goes to negative end of the battery, and another tab connects the cathode to the positive end of the battery. While Li-ion batteries are commercially packaged in different form factors such as pouch, prismatic, and cylindrical, e-cigarettes typically use cylindrical batteries (Figure 4).

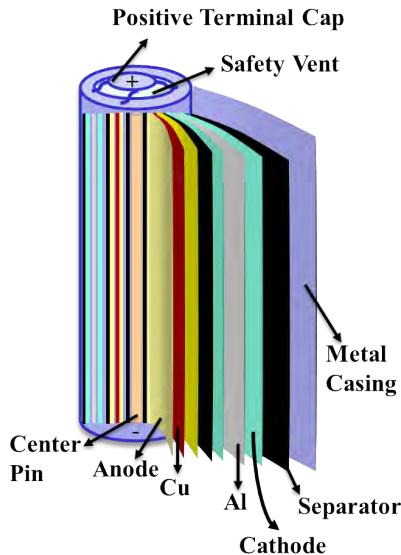


FIGURE 4. Internal layers of a cylindrical Li-ion battery.

Despite many advantages, Li-ion batteries pose safety risks due to the presence of its flammable electrolyte and

²Li-ion batteries are intercalation-based rechargeable batteries in which lithium ions move between the two electrodes during charging and discharging. Li-ion batteries mainly have six components: A negative electrode (anode) usually made of graphite and a positive electrode (cathode) usually made of lithium metal oxide. These electrodes provide sites within their crystal structures for the Li-ion intercalation and exhibit different chemical potential depending upon the redox reactions taking place on them. The difference of chemical potentials of the two electrodes result into the overall battery terminal voltage. The two electrodes are glued on two current collectors with the help of binder materials. The negative and positive current collectors are usually made of copper (Cu) and aluminum (Al), respectively. The current collectors are connected to external battery terminals through metallic tabs. A separator usually made of a polymeric material such as polyethylene and polypropylene is located in the middle of the two electrodes to electrically insulate them from each other. The separator remains soaked into liquid organic electrolyte and contains micro-pores which provide a pathway for the movement of Li-ions. The electrolyte contains a solution of lithium salts such as LiPF₆ in organic solvents and serves as a transport medium for the lithium ions to travel between the two electrodes.

highly reactive lithium element. A battery management system (BMS) is therefore necessary to control operational conditions that can cause safety problems. While the functionalities of a BMS vary depending upon the application, most BMSs include overvoltage, overcurrent, and overheating protection, and an indication of state of charge. The circuit design and schematic for BMS depend upon the required functions and can vary from simple to highly complex. Given the importance of the BMS, IC manufacturing companies including Texas Instruments and Linear Technology provide chips for battery management. However, even when a BMS is employed, battery catastrophic failure is possible if there are defects present in the battery.

Defects can get introduced into a battery during any stage in the manufacturing process. For example, during the electrode preparation process, non-uniform coating of the electrode on current collector can lead to varied thickness. Electrodes can also have pinhole defects (absence of coating) which are caused by the bubbles trapped inside the electrode during the slurry process before being baked into the solid phase. Similarly, blisters/agglomerates can be generated in the electrode if the components in the coating have not been mixed for appropriate required time to form homogeneous slurry [27]. All these electrode defects can lead to inferior electrochemical performance and localized overheating in the electrode. Localized overheating can further degrade the electrode material and melt the nearby separator causing short between anode and cathode. Defects in the separator include holes, inferior puncture strength, and clogged pores. It has been shown in [28] that local separator deformation or pore closures creates "hot spots" of high electrochemical activity that can cause local lithium plating. This plated lithium consumes active lithium (reducing battery capacity) and opens up the possibility of internal short-circuit through lithium dendrites.

In addition to the defects within the battery materials and components, unwanted metallic particles can also be introduced during the battery manufacturing process. These particles can form a conductive pathway between the positive and negative terminals and lead to short circuit. Other assembly related defects in Li-ion batteries include non-uniform positioning of electrode layers, stacking of positive and negative tabs adjacent to each other, metal protrusions on the tabs and current collectors, and improper tab welding resulting in burrs. These defects have not been properly investigated in the past battery research literature. For example, one of the causes of the Samsung Galaxy Note 7's failure was attributed to the welding burrs on the tab, which resulted in internal short circuit [29]. Figure 5 shows how the non-uniform positioning of the anode overhangs near positive terminal of the battery can cause short circuit between each other or with the nearby cathode layers. These internal short circuits can increase temperatures that melt the separator causing a sustained short circuit and can lead to thermal runaway, fires and explosions.

Thermal runaway is a process which occurs when the temperature of the battery increases uncontrollably and rapidly

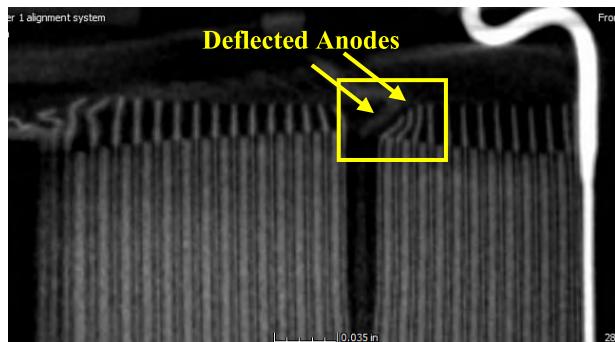


FIGURE 5. A CT-Scan of cylindrical Li-ion battery near the positive terminal shows the deflected anode layers that can cause internal short-circuit.

due to the self-heating exothermic reactions and thermal decomposition of battery components. During thermal runaway, battery temperatures can reach as high as 900°C [30] and battery can release flammable and toxic gases including CO, CO₂, CH₄, C₂H₄, C₂H₆, and H₂ [31]. The onset of thermal runaway is usually preceded by the thermal breakdown of solid electrolyte interphase (SEI) layer³ at roughly 100 °C, followed by the thermal decomposition/reaction of electrolyte with anode and cathode materials [32]. In lithium metal oxide cathode based batteries, the onset of thermal runaway, usually occurs in the range of 150-170 °C [31], [32]. At this temperature, the lithium metal oxide cathode starts to break down releasing oxygen and facilitating the oxidation and combustion of the battery components and gases, which further causes the rapid increase in battery temperature and the buildup of pressure inside the battery.

In some cylindrical batteries, physical safety vents are located below the positive terminal cap (Figure 4) to release excessive pressure built inside the battery and prevent rupture of the battery. However, in thermal runaway testing of cylindrical Li-ion batteries at CALCE [33], the safety vent was often found to be insufficient to stop an explosion. Nevertheless, batteries with no safety vents generally pose a higher risk of explosion and have more catastrophic explosions.

Besides e-cigarettes, Li-ion battery thermal runaway failures include the battery cargo fire that led to the crash of a Boeing 747 in September 2010 [34], fires of batteries in the Boeing 787 that led to its worldwide grounding in January of 2013 [11], and numerous fire incidents involving hoverboards [13], Samsung's Galaxy Note 7 smartphone [14], and Apple's iPhones [35], [36]. In fact, the FAA has reported over 46 incidents of Li-ion battery fires, smoke and explosion in airplanes in 2017 alone [25].

IV. REWRAPPED AND COUNTERFEIT BATTERIES

Defective and substandard batteries can enter the e-cigarette market through either authorized manufacturers who did

³The SEI layer forms on the surface of the anode particles due to the reaction between anode and electrolyte materials during the initial few charge-discharge cycles after the manufacturing of battery. A stable SEI layer protects the anode from further reacting with the electrolyte and helps in improving the cycle life.

not employ sufficient quality checks or through unauthorized retailers and suppliers who may be deliberately selling mis-labeled or poor quality batteries, in some cases including defective, substandard, degraded, and damaged batteries which they purchased at low prices from other sources and, then relabeled them (re-wrapped) under their own brand name or under the brand name of some well-known battery manufacturers.

A look at internet portals selling Li-ion batteries for e-cigarettes shows the widespread availability of rewrapped batteries. Some of these rewrapped batteries are lower-grade batteries either rejected or binned as low quality by major battery manufacturers such as Samsung, Sony, LG, and Panasonic [37], [38], because they didn't meet all the data sheet requirements, or didn't pass all the qualification tests. These low quality batteries are purchased, a new label is placed on them, and thus they are sold under a different company name, sometimes with exaggerated ratings and occasionally at a higher price than batteries from the original manufacturers [37].

Companies who rewrap the batteries most often do not inform the buyers about the actual specifications and original manufacturer of the batteries [38]. This is troublesome, since rewrapped battery brands often advertise ratings that are not accurate. According to a Mooch's blog [39], most of the rewrapped batteries with an amperage rating over 30 A are actually only 20 A or lower amperage batteries, whereas batteries manufactured by LG, Samsung and Sony match their advertised continuous discharge current ratings. Usage of these 20 A or lower amperage batteries in e-cigarette applications requiring 30 A current will lead to overheating and in a worst case, explosion. To address user's concerns with rewrapped batteries, some companies are adding "authentication", or anti-counterfeiting stickers to their battery labels; but some rewrapped batteries have also been found to have this labeling, and counterfeiters are also using this labelling. As a result, the label is not a good guarantee of anything.

Similar to the rewrapped batteries, counterfeit batteries often have substandard materials, lower ratings than advertised and inferior quality. Counterfeit Li-ion batteries - which have also been reported in cellphones, laptops, hoverboards and cameras [13], [40], [41], [42] - can be created by recycling, remarking, tampering, and cloning. Counterfeit batteries are the ones which "visibly" appear true replica of the batteries made by the original battery manufacturer, but differ in quality, reliability, design, materials, or ratings, often with false quality and safety standard markings. On Feb. 15th, 2013, UL (Underwriters Laboratories), an American safety consulting and certification company, released a notification about some Li-ion battery models bearing a counterfeit UL Listing Mark for the United States [43].

In 2015, a woman was sentenced for selling counterfeit Samsung batteries on Ebay [44]. In order to make users aware of the counterfeit batteries, many companies have issued warning, such as the one on the Nikon website [42]:

“Since December, 2003, Nikon has issued warnings regarding safety issues related to the use of counterfeit accessories for Nikon digital cameras, including rechargeable Li-Ion batteries, battery chargers, and AC adapters.”

“Counterfeit products may not be equipped with safety mechanisms such as the protection device. When these counterfeit products are used, camera performance may be sacrificed, and/or more importantly, the products may be the cause of fire or explosion due to the generation of extreme heat or leakage.”

In one battery incident brought to the authors' attention for investigation, a battery caught fire while in the pants pocket of an e-cigarette user, resulting in severe burns to his leg. The battery label identified the company MXJO, as the manufacturer. There was also a label to check to ensure that the battery was authentic, and which listed the Taiwanese website, www.mxjo.tw for the battery manufacturer. Upon accessing the website, the Taiwanese address (No. 187, Kewang Road, Gaoyuan Village, Longtan Town, Taoyuan Country, Taiwan Province) was obtained. However, we went to the location of the manufacturer in Taiwan and found that no such address existed. Furthermore, we contacted the manufacturer, but they said that MXJO has no manufacturing in Taiwan.

Given the safety risks associated with defective and sub-standard batteries, it is the responsibility of e-cigarette device manufacturers to prevent the use of rewrapped and counterfeit batteries in their devices. Furthermore, e-cigarette users must be aware of the risks associated with purchasing batteries from unauthorized and untrustworthy distributors. The e-cigarette industry also has the collective responsibility to prevent counterfeit parts/batteries from infiltrating the e-cigarette supply chains, which can be achieved by either adopting counterfeit prevention and detection standards such as the those developed and adopted by G19 (electronic counterfeit) and G21 (non-electronic counterfeit) committees or developing their own industry-specific standards. Finally, the major battery manufacturers can prevent the circulation of rewrapped batteries by destroying batteries that do not meet their reliability standards. All these remedial actions by different stakeholders in e-cigarette devices can help in preventing the battery fires and explosions.

V. CONCLUSIONS

In April 2017, the U.S. FDA⁴ conducted a two-day public workshop on “Battery Safety Concerns in Electronic Nicotine Delivery Systems (ENDS)” to initiate discussion in this direction. The workshop sought to gather information,

⁴In 2016, FDA finalized a rule extending CTP's (Center for Tobacco Products) regulatory authority to cover all tobacco products, including electronic nicotine delivery systems (ENDS) that meet the definition of a tobacco product [4]. FDA now regulates the manufacture, import, packaging, labeling, advertising, promotion, sale, and distribution of ENDS, including components and parts of ENDS but excluding accessories [4]. “Certain Batteries” have been considered under the category of components.

including research and data, on ENDS battery safety concerns (e.g., overheating, fire, explosion, and other modes of failure), factors that contribute to ENDS battery failures and information on ENDS design features and other parameters that may impact the occurrence of these failures [45]. Various speakers from battery manufacturer industry, government and private regulatory or standards designing bodies like Federal Aviation Administration (FAA), U.S. Consumer Product Safety Commission (CPSC), and Underwriters Laboratories (UL) and e-cigarette manufacturer industry presented their experience with battery fires in e-cigarettes. The sessions covered wide variety of topics including Scope and Impact of ENDS Battery-Related Fires and Explosions, Cell, Battery Pack, Charging Safety, Risk Control, Safety Features for Risk Mitigation, Current Practices of ENDS Battery-Related Risk Communication, and Best Practices for Risk Communication [46], [47]. The discussion in the workshop suggested that due to the widespread availability of low cost Li-ion batteries in the market with little or no information on their quality and reliability, it was necessary for e-cigarette manufacturers to follow stringent testing standards, design their systems for worst case conditions and effectively communicate the risks associated with substandard Li-ion batteries with the end users. As of August 2017, the FDA has extended timelines to submit tobacco product review applications for ENDS up to August 8, 2022. This will afford the agency time to develop product standards to protect against known public health risks such as electronic nicotine delivery systems (ENDS) battery issues [48].

To ensure the safe operation of Li-ion batteries in e-cigarette devices, manufacturers should include a BMS circuit in their design to monitor the battery electrical and thermal parameters, to regulate the current drawn from the battery, and to protect the battery from extreme operating conditions by shutting down the operation of e-cigarette. However, BMS alone cannot solve the e-cigarette fire problems when defective or falsely labeled batteries are being used. The sudden rise in the e-cigarette market and user base, absence of proper business and testing regulations, long supply chains, and lack of awareness among e-cigarette users have provided an environment for the distribution of defective and substandard batteries. Hence, it is now the responsibility of e-cigarette manufacturers to effectively monitor and control the supply chains of their batteries through coordination with original battery manufacturers, to perform in-house testing of their batteries under expected as well as extreme conditions to determine all the possible failure modes, and to educate the e-cigarette users of the risks associated with rewrapped and low quality batteries. At the same time government and industrial regulatory organizations should develop and enforce standards and regulations to ensure the safety of e-cigarette devices.

APPENDIX

See Table 1.

TABLE 1. List of reported e-cigarette fire and explosion incidents [15].

Location	Date	Source URL	Notes
Santa Rosa, CA	January 2017	http://kron4.com/2017/01/04/man-escapes-santa-rosa-motel-fire-sparked-by-e-cigarette/	The e-cigarette was left on a bed. E-cigarette fire ignited the bed.
Little Rock, AR	December 2016	http://www.star-telegram.com/news/local/community/fort-worth/article121150273.html	The e-cigarette produced smoke and spark. The flight was diverted to Little Rock.
New York, NY	December 2016	http://www.nydailynews.com/new-york/bronx-emt-suffers-major-burns-e-cigarette-explosion-article-1.2903863	The e-cigarette backup battery exploded in the owner's pocket while he was driving.
Petoskey, MI	December 2016	http://www.9and10news.com/story/34065155/overt-heating-e-cigarette-prompts-firefighters-to-respond-to-emmet-condo	The e-cigarette smoked, but firefighters prevented further damage.
Fresno, CA	December 2016	http://abc30.com/news/1-injured-after-e-cigarette-explodes-on-fax-bus/1667422/	The e-cigarette exploded in the owner's hand.
Putnam County, NY	December 2016	http://newyork.cbslocal.com/2016/12/22/latest-e-cigarette-explosion/	The e-cigarette exploded in the owner's pocket and caused second and third-degree burns.
Leeds, UK	December 2016	http://www.telegraph.co.uk/news/2016/12/22/dramatic-cctv-footage-shows-e-cigarette-battery-exploding-mans/	The e-cigarette exploded in the owner's pocket.
Toulouse, France	November 2016	http://www.mirror.co.uk/news/world-news/e-cigarette-battery-suddenly-explodes-9193935	The e-cigarette backup battery exploded in the owner's pocket and caused second-degree burns on his stomach.
Stratford, CT	December 2016	http://abc7ny.com/news/exclusive-man-speaks-out-after-e-cig-explodes-in-mouth/1656673/	The e-cigarette exploded while the owner was smoking.
New York, NY	November 2016	http://www.gizmodo.co.uk/2016/11/customised-e-cigarette-explodes-in-mans-trousers-again/	The e-cigarette exploded in a man's trousers. As per the victim's coworker, the e-cigarette had been customized to work at higher voltage than the original design.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Berlin, NJ	October 2016	http://philadelphia.cbslocal.com/2016/12/15/e-cig-explosions/	Multiple lawsuits were filed for injuries related to e-cigarettes.
Seattle, WA	October 2016	http://www.seattlepi.com/local/article/4-Washingtonians-sue-for-e-cigarette-explosions-9969864.php	Four people filed separate lawsuits against e-cigarette sellers claiming they suffered injuries from e-cigarette battery explosions.
Wales, UK	October 2016	http://www.mirror.co.uk/news/world-news/horrifying-moment-mans-e-cigarette-9145148	The e-cigarette exploded in the owner's pocket.
Ketchikan, AK	October 2016	http://www.alaskapublic.org/2016/10/31/alaska-air-flight-grounded-after-e-cig-batteries-ingnite/	The e-cigarette exploded in one passenger's backpack.
Wirral, UK	October 2016	https://www.thesun.co.uk/news/2001603/inside-home-ravaged-by-fire-sparked-by-an-exploding-e-cigarette-which-almost-killed-owner/	The e-cigarette exploded during charging and burned the entire house.
South Shields, UK	October 2016	http://www.shieldsgazette.com/news/e-cigarette-sparks-evacuation-of-south-shields-supermarket-1-8159245	The e-cigarette smoked during charging.
Orlando, FL	October 2016	http://www.orlandosentinel.com/news/breaking-news/os-teen-injured-universal-cigarette-20161001-story.html	The e-cigarette exploded in a man's pocket and also hurt a girl nearby.
Phoenix, AZ	October 2016	http://www.abc15.com/news/region-phoenix-metro/central-phoenix/family-is-warning-the-public-after-electronic-cigarette-explosion-in-phoenix-mans-pocket	The e-cigarette exploded in the owner's pocket.
Staten Island, NY	September 2016	http://www.silive.com/news/index.ssf/2016/09/explosion_at_castleton_corners.html	The e-cigarette exploded in a woman's purse.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Calloway County, MO	September 2016	http://www.abc17news.com/news/e-cigarette-reportedly-explodes-starts-car-fire/81128840	The e-cigarette explosion caused fire in the owner's car.
Freehold, NJ	September 2016	http://www.breitbart.com/big-government/2016/09/14/video-explosion-inside-womans-1900-purse-sparks-mall-panic-911/	The e-cigarette exploded in a woman's purse.
Haralson County, GA	September 2016	http://www.ajc.com/news/local/cigarette-battery-explosion-like-hand-grenade-pocket/LvP3W9w5xYyTZh5SPyF0TO/	The e-cigarette exploded in the owner's pocket.
Nefyn, Wales, UK	August 2016	http://www.cambrian-news.co.uk/article.cfm?id=107715&headline=E-cigarette%20causes%20house%20fire&sectionIs=news&searchyear=2016	The e-cigarette exploded during charging and caused fire in the house.
Bristol, UK	August 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette exploded in the owner's pocket.
Arlington, TX	June 2016	http://www.star-telegram.com/news/local/community/arlington/article101570947.html	The e-cigarette exploded and caused severe burns to the owner.
Chelmsford, MA	June 2016	http://boston.cbslocal.com/2016/07/02/chelmsford-electronic-cigarette-explosion/	The e-cigarette exploded during charging.
Kirkland/Seattle, WA	June 2016	http://www.kiro7.com/news/local/seattle-hospital-sees-increase-in-e-cigarette-explosions/335778312	Two people including a 2-year-old boy were treated for burns caused by e-cigarette fire.
Tustin, CA	June 2016	http://losangeles.cbslocal.com/2016/06/10/tustin-man-remains-hospitalized-after-e-cigarette-explosion-in-his-mouth/	The e-cigarette exploded in the owner's mouth.
Muskogee, OK	June 2016	http://www.fox23.com/news/man-sues-local-e-cigarette-store-after-device-explosion-in-mouth/331004588	The e-cigarette exploded in the owner's mouth.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
St. Joseph, KS	May 2016	http://www.newspressnow.com/news/local_news/article_f60d5ddc-5f4e-5253-8eb0-84504e546ac2.html	The e-cigarette exploded in the owner's pocket.
Plymouth, MA	May 2016	http://plymouth.wickedlocal.com/news/20160524/man-burned-in-e-cigarette-explosion-in-manomet	The e-cigarette exploded in the owner's hand and caused third degree burns.
Margate, UK	May 2016	http://www.kentononline.co.uk/thanet/news/man-burnt-after-e-cig-explodes-96113/	The e-cigarette exploded when the owner inserted the battery into the device.
Albany, NY	May 2016	http://www.cnn.com/2016/05/19/health/exploding-vaporizer-rip-tongue-trnd/	The e-cigarette exploded in the owner's mouth.
Bolton, UK	May 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette battery exploded during charging.
Albertville, AL	May 2016	http://www.natlawreview.com/article/another-student-burned-e-cigarette-time-during-school	The e-cigarette battery exploded on a desk in the school.
Ogden, NY	May 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette exploded in the owner's mouth.
Albuquerque, NM	May 2016	http://www.kob.com/investigative-news/e-cigarette-explosions-why-itrsquo-s-happening-so-often/4127421/	The e-cigarette exploded in the owner's pocket while he was driving.
Irvine, CA	May 2016	http://abc7.com/news/orange-county-man-loses-eye-after-e-cigarette-explosion/1332401/	The e-cigarette exploded during usage. The owner lost his left eye due to this incident.
Fulton County, GA	April 2016	http://www.wsbtv.com/news/local/south-fulton-county/man-seriously-burned-after-e-cigarette-batteries-explode/243770928	The e-cigarette exploded in the owner's pocket.
Colorado Springs, CO	April 2016	http://www.koaa.com/story/31801206/burned-man-shares-safety-warning-after-battery-explosion-caught-on-camera	The e-cigarette exploded in the owner's pocket.
Paso Robles, CA	April 2016	https://pasoroblesdailynews.com/local/teen-hospitalized-after-e-cig-reportedly-explodes-during-use/53099/	The e-cigarette exploded during usage.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Long Island, NY	April 2016	http://www.nbcnewyork.com/news/local/Long-Island-Man-Burned-Exploding-E-Cigarette-Battery-Pocket-376809971.html	The e-cigarette exploded in the owner's pocket.
Oswego, IL	April 2016	http://wgntv.com/2016/04/19/e-cigarette-may-be-to-blame-for-car-fire-in-suburban-wal-mart-parking-lot/	The e-cigarette exploded in a car.
Queens, NY	April 2016	http://www.nydailynews.com/new-york/e-cigarette-violently-explodes-pocket-queens-woman-article-1.2607505	The e-cigarette suddenly exploded in a woman's jeans pocket with such force that it got stuck in the dashboard of her car.
Oklahoma City, OK	April 2016	http://ksn.com/2016/04/20/exploding-e-cigarette-injures-teen/	The e-cigarette exploded in the owner's pocket.
Denpasar, Bali	April 2016	http://lampung.tribunnews.com/2016/04/15/rokok-elektronik-yang-dilisap-meledak-dada-pria-interbakar-dan-kelopak-matanya-robek	The e-cigarette battery exploded during usage.
Idaho Falls, ID	April 2016	http://www.localnews8.com/news/kifi-top-story/local-man-injured-from-e-cigarette_20160825070832821/58580069	The e-cigarette exploded in the owner's pocket.
Brooklyn, NY	April 2016	http://www.nydailynews.com/new-york/boy-14-partially-blinded-exploding-e-cigarette-battery-article-1.2601552	The e-cigarette exploded when a wrong battery was inserted.
Crawley, UK	April 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette battery exploded during charging.
Derbyshire, UK	April 2016	http://www.derbytelegraph.co.uk/e-cigarette-charged-wrong-device-causes-house/story-29069628-detail/story.html	The e-cigarette battery exploded during charging.
Phoenix, AZ	April 2016	http://www.azfamily.com/story/31662894/valley-mans-vape-pen-explodes-causes-second-and-third-degree-burns	The e-cigarette exploded in the owner's pocket.
Glasgow, Scotland, UK	April 2016	http://www.bbc.com/news/uk-scotland-glasgow-west-35959675	The e-cigarette exploded during charging.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Kalamazoo, MI	April 2016	http://wwmt.com/news/local/kalamazoo-man-says-e-cig-exploded-in-his-hand-causing-burns	The e-cigarette battery exploded during usage.
Bear, DE	March 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette exploded in the owner's pocket.
Las Vegas, NV	March 2016	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette exploded in the owner's pocket.
Arroyo Grande, CA	March 2016	http://www.sanluisobispo.com/news/local/article88047182.html	The e-cigarette battery exploded during usage.
Keene, NH	March 2016	http://www.sentinelsource.com/news/local/e-cigarette-explosion-in-keene-restaurant/article_fa81c331-fba6-5e7d-9988-4042c7f9bf18.html	The e-cigarette battery exploded on the table in a restaurant.
Dunfermline, Scotland, UK	March 2016	http://www.dunfermlinepress.com/news/14349310.Gran_s_lucky_escape_after_e_cigarette_explodes/	A charged (but not connected to the electrical socket) e-cigarette exploded.
Atlanta, GA	March 2016	http://abcnews.go.com/US/delta-flight-delayed-cigarette-ignites-passengers-carry/story?id=37710018	The e-cigarette exploded in one passenger's bag but caused no injury.
New Hanover County, NC	March 2016	http://www.hawaiinewsnow.com/story/31386547/man-loses-eye-after-e-cigarette-explodes	The e-cigarette battery exploded during usage.
Fulton, MD	March 2016	http://www.abc2news.com/news/in-focus/howard-county-man-suffers-burns-after-e-cigarette-explodes-in-his-pocket	The e-cigarette exploded in the owner's pocket.
New Orleans, LA	March 2016	http://www.wwltv.com/news/local/man-says-e-cigarette-charger-exploded-on-him-caught-on-fire/66623741	The e-cigarette exploded when a man took it out for vaping.
Kitchener, Ontario	March 2016	http://www.cbc.ca/news/canada/kitchener-waterloo/car-fire-exploding-ecigarette-1.3491837	The e-cigarette exploded in the owner's car.
Vancouver, WA	February 2016	http://www.seattlepi.com/local/article/4-Washingtonians-sue-for-e-cigarette-explosions-9969864.php	The e-cigarette exploded in the owner's pocket.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Naples, FL	February 2016	http://www.winknews.com/2016/02/26/woman-severely-burned-in-e-cigarette-explosion/	The e-cigarette exploded when the owner pressed the button to vape
Castle Rock, CO	February 2016	http://www.dailymail.co.uk/news/article-3469655/Sparks-started-flying-pocket-Teen-suffers-horrfic-degree-burns-e-cigarette-explodes-pants.html	The e-cigarette exploded in the owner's pocket.
Anglet, France	February 2016	https://www.thelocal.fr/20160218/france-exploding-e-cigarette-sets-four-cars-on-fire	The e-cigarette exploded in the owner's car.
Owensboro, KY	February 2016	https://www.techworm.net/2016/02/e-cigarette-battery-explodes-mans-pocket-leaving-severely-injured.html	The e-cigarette exploded in the owner's pocket.
Woodley, UK	February 2016	http://www.manchestereveningnews.co.uk/news/greater-manchester-news/ecig-battery-explodes-bag-injury-10927117	The e-cigarette exploded in the owner's pocket.
Rochester, NH	February 2016	http://www.wmur.com/article/electronic-cigarette-explodes-while-charging-in-rochester-apartment/5208926	The e-cigarette exploded in the owner's apartment and luckily caused no injury or damage.
Seattle, WA	February 2016	http://www.seattletimes.com/seattle-news/health/exploding-e-cigarettes-send-vapers-to-harborview-with-gruesome-injuries/	The e-cigarette exploded in the owner's hand.
Salt Lake City, UT	February 2016	http://fox13now.com/2016/02/19/utah-man-burned-by-exploding-battery-urges-other-e-cigarette-users-to-be-cautious/	The e-cigarette battery exploded in the owner's pocket.
Tamworth, UK	February 2016	http://www.dailymail.co.uk/health/article-3452736/Father-left-scared-life-e-cigarette-battery-explodes-pocket-like-firework.html	The e-cigarette battery exploded in the owner's pocket.
Phoenix Metro, AZ	February 2016	http://www.abc15.com/news/region-phoenix-metro/central-phoenix/valley-man-burned-after-e-cigarette-explodes	The e-cigarette battery exploded in the owner's pocket.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Bury, UK	February 2016	http://www.mirror.co.uk/news/uk-news/e-cigarette-explosion-mans-pocket-7464866	The e-cigarette exploded in the owner's pocket.
Aylesham, UK	February 2016	http://www.mirror.co.uk/news/uk-news/e-cigarette-battery-explosion-mans-7440075	The e-cigarette exploded in the owner's pocket.
Surprise, AZ	February 2016	http://www.12news.com/news/local/valley/surprise-man-recovering-from-e-cig-explosion/57563458	The e-cigarette battery exploded in the owner's pocket.
Missoula, MT	February 2016	http://www.kpax.com/story/31124776/missoula-teenager-loses-teeth-to-exploding-e-cigarette	The e-cigarette battery exploded during usage.
Lyndhurst, OH	February 2016	http://fox8.com/2016/02/24/e-cigarette-explosion-at-lyndhurst-office-building/	The e-cigarette battery exploded in the owner's pocket.
Splendora, TX	February 2016	http://www.fox4news.com/news/texas/84728658-story	The e-cigarette exploded in the owner's pocket.
Manchester, UK	January 2016	http://www.manchestereveningnews.co.uk/news/greater-manchester-news/electronic-cigarette-terrified-dads-pocket-11113742	The e-cigarette exploded in the owner's pocket.
NA	January 2016	https://www.e-cigarette-forum.com/forum/threads/explosion-at-my-local-shop.727120/	The e-cigarette exploded immediately after inserting a battery.
Glasgow, Scotland, UK	January 2016	http://www.dailymail.co.uk/news/article-3417305/Bartender-21-suffered-agonising-second-degree-burns-e-cigarette-bought-eBay-exploded-fireball-using-it.html	The e-cigarette exploded in the owner's hand.
Cologne, Germany	January 2016	https://www.thelocal.de/20160128/e-cigarette-explosion-and-blows-mans-teeth-out?	The e-cigarette exploded in the owner's hand.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Los Angeles, CA	January 2016	http://www.dailymail.co.uk/news/article-3422869/Flames-came-shooting-bottom-Veteran-34-permanently-scarred-e-cigarette-exploded-near-face.html	The e-cigarette exploded in the owner's hand.
Englewood, FL	January 2016	http://www.winknews.com/2016/01/21/man-loses-teeth-jaw-wired-together-after-e-cig-explodes/	The e-cigarette exploded during the usage.
White House, TN	January 2016	http://kval.com/news/nation-world/white-house-teen-burned-by-exploding-vape-warns-of-potential-dangers	The e-cigarette battery exploded in the owner's pocket.
Lethbridge, Alberta	January 2016	http://globalnews.ca/news/2481712/vape-retailers-believe-lethbridge-man-was-uneducated-on-electronic-cigarettes/	The e-cigarette battery exploded in the owner's mouth.
Hawaii	January 2016	http://www.hawaiinewsnow.com/story/30981530/e-cigarette-sparks-fire-on-hawaiian-airlines-flight-to-maui	The e-cigarette on a Hawaii Airlines flight caused fire which started in the baggage area. The pilot was able to put it out with a fire extinguisher and land the plane safely.
California	January 2016	http://www.nbclosangeles.com/news/local/e-cigarette-explode-lawsuit-battery-los-angeles.html	The e-cigarette battery exploded in the owner's pocket.
Salford, UK	January 2016	http://www.mirror.co.uk/news/uk-news/horrific-e-cigarette-explosion-tears-7224590	The e-cigarette exploded in the owner's mouth.
Windsor, CA	January 2016	http://www.pressdemocrat.com/news/5144837-181/windsor-teen-badly-hurt-when	The e-cigarette exploded in the owner's hand.
Jackson County, IN	January 2016	http://cbs4indy.com/2016/01/06/e-cigarette-explosion-blamed-for-truck-drivers-crash-on-i-65/	The e-cigarette exploded during the usage.
Northwich, UK	January 2016	http://www.mirror.co.uk/news/uk-news/e-cig-battery-turned-human-7192440	The e-cigarette exploded near the owner's face.
Ladera Ranch, CA	January 2016	http://www.cbsnews.com/news/e-cigarette-explodes-in-teens-pocket-at-work/	The e-cigarette exploded in the owner's pocket.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Colorado Springs, CO	January 2016	http://www.9news.com/news/health/colorado-teen-severely-burned-in-e-cig-explosion/39581822	The e-cigarette exploded in the owner's pocket.
Moultonborough, NH	January 2016	http://www.unionleader.com/Man-whose-e-cigarette-exploded-sues-manufacturer-and-store	The e-cigarette exploded in the owner's pocket.
Shropshire, UK	January 2016	http://www.independent.ie/world-news/europe/man-22-lucky-to-be-alive-after-e-cigarette-explodes-in-his-mouth-34430659.html	The e-cigarette exploded in the owner's mouth.
Philippines	Early 2016	https://www.e-cigarette-forum.com/forum/threads/vent-short-protected-mod.733754/	The e-cigarette exploded in the owner's hand.
Omaha, NE	Late 2015	http://www.ketv.com/article/vaporizer-explodes-in-mans-mouth/8302383	The e-cigarette exploded in the owner's mouth.
Gulfport, FL	December 2015	http://saintpetersblog.com/gulfport-man-claims-samsung-vaping-battery-exploded-caught-fire/	The e-cigarette exploded in the owner's pocket.
Pismo Beach, CA	December 2015	http://www.newtimesslo.com/news/13377/pismo-man-sues-after-hes-injured-by-exploding-e-cigarette/	The e-cigarette exploded in the owner's hand immediately after pressing the button.
Oklahoma	December 2015	http://kfor.com/2015/12/08/blood-just-pouring-down-e-cig-explodes-in-oklahoma-mans-face/	The e-cigarette exploded in the owner's hand while he was adding e-liquid.
Ogden, UT	December 2015	http://www.standard.net/fire/2015/12/25/christmas-house-fire-ogden-exploding-e-cigarette	The e-cigarette exploded in the owner's face.
Clovis, CA	December 2015	http://abc7news.com/news/explosive-lawsuit-could-light-up-e-cigarette-industry/1224224/	The e-cigarette exploded in the owner's pocket.
Grand Rapids, MI	December 2015	http://fox17online.com/2015/12/08/id-rather-have-lung-cancer-e-cigarette-explodes-in-mans-pocket/	The e-cigarette exploded in the owner's pocket.
Huntsville, AL	December 2015	http://www.wsfa.com/story/34066138/huntsville-man-sues-after-e-cigarette-battery-explodes	The e-cigarette exploded in the owner's pocket.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Bentonville, AR	November 2015	http://www.arkansasmatters.com/news/local-news/e-cigarette-explosion-in-bentonville-mans-face	The e-cigarette exploded in the owner's mouth immediately after pressing the button.
Colorado Springs, CO	November 2015	http://www.cbsnews.com/news/man-seriously-injured-by-e-cigarette-explosion/	The e-cigarette exploded in the owner's mouth during usage.
Cape Coral, FL	November 2015	http://www.nbc-2.com/story/30387843/cape-man-is-latest-to-suffer-from-e-cigarette-malfunction#.VvCOGeIRLDc	The e-cigarette exploded in the owner's pocket.
Hollywood, FL	November 2015	http://www.local10.com/news/tina-kruzyck-says-e-cigarette-exploded-while-she-slept-caught-bed-on-fire	The e-cigarette was plugged in during explosion.
Columbus, NE	November 2015	http://www.kearneyhub.com/news/regional/columns/man-almost-loses-an-ear-in-e-cigarette-explosion/article_6496bd6e-8d6e-11e5-aff1-3fabf4c602ba.html	The e-cigarette exploded near the owner's head.
Newport Beach, CA	November 2015	http://abc7.com/news/ne-wport-beach-man-suffers-burns-after-e-cigarette-explodes/1104400/	The e-cigarette exploded in the owner's hand.
Exmouth, UK	November 2015	http://www.mirror.co.uk/news/uk-news/e-cigarette-battery-blows-up-6904034	The e-cigarette exploded in the owner's pocket.
Washington County, PA	November 2015	http://www.wpxi.com/news/local/e-cig-battery-explodes-sets-washington-county/26882472	The e-cigarette exploded in the owner's car.
Gopeng, Malaysia	November 2015	http://newsinfo.inquirer.net/738919/man-injured-after-e-cigarette-explodes-in-face-in-malaysian-town	The e-cigarette exploded near the owner's head.
Malaysia	October 2015	http://www.channelnewsasia.com/news/asiapacific/internal-probe-launched-after-e-cigarette-caught-fire-on-malindo-8228796	An electronic smoking device caught fire on a Malindo Air flight. The fire caused light injuries to the passenger before being extinguished by the crew members.
Bakersfield, CA	October 2015	http://losangeles.cbslocal.com/2015/11/19/bakersfield-man-suffers-serious-injuries-after-e-cigarette-explosion/	The e-cigarette exploded in the owner's mouth during usage.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Wichita, KS	October 2015	https://consumerist.com/2015/10/26/man-says-e-cigarette-exploded-in-his-hand-pieces-of-metal-pierced-wall/	The e-cigarette exploded in the owner's hand.
Springfield, PA	October 2015	http://www.iradiophilly.com/conversation.php?idConversation=5242	The e-cigarette exploded in the owner's pocket.
Wyandotte, MI	October 2015	https://patch.com/michigan/royaloak/man-injured-exploding-e-cigarette-congresswoman-urges-fda-overight	The e-cigarette exploded in the owner's hand while he was using it.
Naples, FL	October 2015	http://www.foxnews.com/health/2015/10/28/florida-man-placed-in-coma-after-e-cigarette-explosion.html	The e-cigarette exploded in the owner's mouth while he was using it.
Bettws, Wales, UK	August 2015	http://www.mirror.co.uk/news/uk-news/familys-miracle-escape-e-cigarette-6240361	An e-cigarette plugged into a phone charger exploded and started a fire in the bedroom.
Cardiff, Wales, UK	August 2015	http://www.mirror.co.uk/news/uk-news/e-cigarette-charger-fire-tears-6278102	The e-cigarette charger was considered as the source of the fire.
Cobb County, GA	July 2015	https://www.aol.com/article/2015/09/08/man-severely-injured-after-e-cigarette-explodes-in-his-mouth/21233058/	The e-cigarette exploded in the owner's mouth while he was using it.
Miramar Beach, FL	July 2015	http://www.waltonsun.com/article/20150731/news/307319906	The e-cigarette exploded in the owner's mouth while he was using it.
Nantes, France	May 2015	https://www.thelocal.fr/20150518/frenchman-injured-by-exploding-e-cigarette	The e-cigarette exploded in the owner's hand while he was using it.
Runcorn, UK	April 2015	http://www.liverpoolecho.co.uk/in-your-area/fire-warning-after-e-cigarette-charger-9095036	Explosion occurred when the e-cigarette device was connected to the charger.
Little Egg Harbor Township, NJ	April 2015	http://www.pressofatlanticcity.com/news/breaking/little-egg-harbor-knows-e-cigarettes-can-explode/article_6f7693d0-ed4b-11e4-b70f-a3cb9214b370.html	An e-cigarette exploded. The owner admitted that she had been charging the e-cigarette with a cellphone charger.
Jupiter, FL	April 2015	http://palmbeachhealthbeat.blog.palmbeachpost.com/2015/05/27/jupiter-schoolteacher-claims-vape-battery-exploded-in-pants/	The e-cigarette battery exploded in the owner's pocket.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Gates, NY	March 2015	http://www.wkbn.com/news/man-hurt-when-e-cigarette-turns-into-mini-pipe-bomb	A man was injured when his e-cigarette exploded. The battery was a nickel cadmium battery.
Santa Ana, CA	March 2015	http://www.nbclosangeles.com/news/local/E-cig-Explosion-Santa-Ana-hand-295729771.html	The e-cigarette exploded in the owner's hand while he was using it.
Arlington, TX	March 2015	http://dfw.cbslocal.com/2015/03/11/arlington-man-sets-crotch-on-fire-sues-vape-shop-over-exploding-e-cig-battery/	The e-cigarette battery exploded in the owner's pocket.
Ramona, CA	February 2015	http://www.nbclosangeles.com/news/california/San-Diego-Man-Burned-E-Cigarette-Explosion-Ramona-291263941.html	The e-cigarette battery exploded in the owner's pocket.
Los Angeles, CA	February 2015	http://abc7.com/1092027/	The e-cigarette exploded during usage.
Anaheim, CA	February 2015	http://www.nbclosangeles.com/news/local/Anaheim-Hills-Teen-Injured-Exploding-E-Cig-291489711.html	The e-cigarette exploded in the owner's hand while he was using it.
Yuba City, AZ	February 2015	http://fox40.com/2015/02/18/e-cigarette-almost-claims-mans-life/	The e-cigarette exploded and burned the owner's house.
Toronto, Ontario	January 2015	https://www.e-cigarette-forum.com/forum/threads/well-my-mechanical-mod-went-boom.645224/	The e-cigarette got hot in the owner's pocket and smoked before the explosion.
Sparks, NV	January 2015	https://www.usatoday.com/story/news/nation-now/2015/01/13/electronic-cigarette-gym-explosion-nevada/21699097/	A high school was partially evacuated due to e-cigarette explosion.
Oak Ridge, TN	January 2015	http://www.local8now.com/home/headlines/Oak-Ridge-womans-e-cigarette-blows-up-while-charging-288744041.html	An e-cigarette exploded while it was on the charger.
Sheerness, UK	December 2014	http://www.kentononline.co.uk/sheerness/news/explosion-e-cig-damages-family-home-28261/	An e-cigarette exploded after it was plugged into the wrong charger.
Wigan, UK	December 2014	http://www.wigtoday.net/news/another-e-cig-fire-drama-1-6993246	The e-cigarette exploded during charging.
Tacoma, WA	November 2014	http://komonews.com/news/local/man-critically-burned-in-house-fire-sparked-by-e-cigarette	An e-cigarette exploded during usage and caused house fire. One man was critically burned.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Rotherham, UK	November 2014	http://www.dailymail.co.uk/news/article-2828746/Ford-Transit-van-explodes-driveway-Rotherham-e-cigarette-left-charging-inside.html	The e-cigarette exploded during charging in a van and caused fire that destroyed the whole van.
Isle of Wight, UK	November 2014	http://www.islandecho.co.uk/news/e-cigarette-safety-advice-couples-lucky-escape	An e-cigarette charger exploded when plugged into a wall socket.
Wigan, UK	October 2014	http://www.syracuse.com/news/index.ssf/2014/10/e-cigarette_explosion_hospital_leg_injuries.html	The e-cigarette exploded during usage.
Sprowston, UK	October 2014	http://www.mirror.co.uk/news/uk-news/tot-cheats-death-after-e-cigarette-4468851	The e-cigarette exploded during charging near a one-year-old boy.
Wales, UK	October 2014	http://www.mirror.co.uk/news/uk-news/grans-home-gutted-fire-after-4463558	The e-cigarette exploded during the charging.
London, UK	October 2014	http://www.standard.co.uk/news/london/school-forced-to-evacuate-after-e-cigarette-explosion-9794762.html	The e-cigarette fire damaged the school building.
Honolulu, HI	September 2014	http://www.hawaiinewsnow.com/story/26659072/explosion-at-honolulu-apartment-blamed-on-e-cigarette	The e-cigarette caught fire during charging.
Limoges, France	September 2014	http://www.ladepeche.fr/article/2014/09/19/1955031-brulee-par-l-explosion-de-sa-cigarette-electronique.html	The e-cigarette explosion caused burns to the owner.
Wallasey, UK	August 2014	http://www.bbc.com/news/uk-england-merseyside-28701515	A man was killed when an e-cigarette exploded during charging.
San Antonio, TX	August 2014	https://www.reddit.com/r/electronic_cigarette/comments/2drwja/vape_blast_cloud_comp_participant_pipebombs_mod/	The e-cigarette heated up and the owner threw it away. Later the e-cigarette exploded.
Orlando, FL	August 2014	http://www.wftv.com/news/local/action-9-investigates-electronic-cigarette-charger_ngwjm/107090259	The e-cigarette exploded during charging.
Ringwood, UK	July 2014	http://www.bbc.com/news/uk-england-hampshire-28419412	The e-cigarette explosion destroyed part of a home.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Oklahoma City, OK	July 2014	http://www.news9.com/story/25939272/e-cigarette-charger-explosion-causes-house-fire	The e-cigarette exploded during charging.
Leigh, UK	July 2014	http://www.dailymail.co.uk/news/article-2675007/Cat-killed-house-fire-started-exploding-e-cigarette-shot-socket-charging-set-fire-bed-sheets.html	The e-cigarette exploded during charging.
Tenby, Wales, UK	May 2014	http://www.walesonline.co.uk/news/wales-news/sleeping-woman-suffers-burns-after-7157257	The e-cigarette exploded during charging.
Birmingham, UK	May 2014	http://metro.co.uk/2014/05/28/mother-and-sons-flee-flat-after-e-cigarette-explosion-4741968/	The e-cigarette exploded during charging.
Aylestone, UK	April 2014	http://www.bbc.com/news/uk-england-leicestershire-27142760	The e-cigarette and car charger adapter exploded in the car.
London, UK	April 2014	http://www.standard.co.uk/news/london/fire-crews-issue-warning-after-woman-hurt-by-e-cigarette-explosion-in-east-london-flat-9262038.html	The e-cigarette explosion caused major damage to a flat.
Stockport, UK	April 2014	https://www.thesun.co.uk/archives/news/740349/e-cig-grandmother-blown-up-in-hospital/	The e-cigarette explosion possibly caused oxygen supply fire in the hospital.
Richmond, UK	April 2014	http://www.yorkpress.co.uk/news/11133501.Barmaid_s_lucky_escape_as_e_cigarette_explodes_in_packed_pub/	The e-cigarette exploded during charging.
Medford, OR	March 2014	http://katu.com/news/local/fire-marshall-e-cigarette-batteries-cause-fires-in-medford	The e-cigarette exploded during charging.
Syracuse, NY	March 2014	http://www.syracuse.com/news/index.ssf/2014/04/syracuse_hospital_bans_e-cigarettes_after_patient_catches_fire_while_using_one.html	The e-cigarette explosion possibly caused oxygen supply fire in the hospital.
Colorado	February 2014	https://www.e-cigarette-forum.com/forum/threads/omg-my-battery-just-now-exploded.529058/	The e-cigarette exploded during charging.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Poole, UK	February 2014	http://www.bbc.com/news/uk-england-dorset-26262633	The e-cigarette exploded during charging.
Neath, UK	February 2014	http://www.mirror.co.uk/news/uk-news/e-cigarette-explosion-sparks-house-fire-3144031	The e-cigarette exploded during charging.
Birmingham, UK	February 2014	http://www.birminghammail.co.uk/news/midlands-news/birmingham-womans-shock-e-cigarette-explodes-6680282	The e-cigarette exploded during charging.
Leicester, UK	February 2014	http://www.leicestermercury.co.uk/EXPLODING-E-CIGARETTE-STARTS/story-20634737-detail/story.html	The e-cigarette exploded but did not cause any injury.
Kirklees, UK	December 2013	http://www.mirror.co.uk/news/uk-news/e-cigarette-dangers-fire-chiefs-warning-2949094	The e-cigarette exploded during charging.
Salt Lake City, UT	December 2013	http://fox13now.com/2013/12/09/e-cigarette-explodes-while-charging/	The e-cigarette exploded during charging.
Phoenix, AZ	December 2013	http://www.abc15.com/news/local-news/investigations/phoenix-fire-department-officials-warn-electronic-cigarette-users-about-fire-danger	The e-cigarette exploded during charging.
Edinburgh, Scotland, UK	December 2013	http://www.edinburghnews.scotsman.com/news/electronic-cigarette-started-council-hq-fire-1-3239305	The e-cigarette exploded during charging.
Kootenai County, ID	November 2013	http://www.wptv.com/news/local-news/water-cooler/e-cigarette-blamed-for-house-fire-in-idaho-electronic-cigarette-battery-overcharged-and-exploded	The e-cigarette exploded during charging.
Warren, MI	November 2013	http://www.wxyz.com/news/warren-woman-says-electronic-cigarette-caused-small-explosion-and-fire	The e-cigarette exploded during charging.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Eugene, OR	November 2013	https://web.archive.org/web/20140210100218/http://www.kval.com/news/local/E-cig-explosion-damaging-truck-231482791.html?	An e-cigarette left charging in a car for about 2 hours exploded and damaged the car.
Colorado Springs, CO	November 2013	http://www.krdo.com/news/local-news/e-cigarette-blamed-for-mattress-fire/34229451	The e-cigarette exploded during charging.
Chesterfield, UK	November 2013	http://www.derbyshiretimes.co.uk/news/chesterfield-e-cigarette-linked-to-fatal-care-home-blaze-1-6225619	The e-cigarette exploded during charging.
Darlington, UK	October 2013	http://www.thenorthernecho.co.uk/news/local/darlington/10716743.REG_LED_E_cigarette_explodes_while_charging_and_destroys_Darlington_other_s_kitchen/	The e-cigarette exploded during charging.
Valparaiso, FL	October 2013	https://web.archive.org/web/2014022115119/http://www.nwfdailynews.com/local/electronic-cigarette-explodes-causes-curtains-on-fire-1.214335	The e-cigarette exploded during charging.
Blaine, MN	October 2013	https://web.archive.org/web/20150315062330/http://www.myfoxtwincities.com/story/23584719/minnesota-e-cig-explosion-charging	The e-cigarette exploded during charging.
La Crosse, WI	October 2013	http://www.dailymail.co.uk/news/article-2442715/E-cigarette-explosion-causes-Wisconsin-home.html	The e-cigarette exploded during charging.
Phoenix, OR	October 2013	http://www.kptv.com/story/23785774/phoenix-fd	The e-cigarette possibly caused house fire in Phoenix.
Vernon, CT	September 2013	https://www.e-cigarette-forum.com/forum/threads/strangest-battery-explosion-ever.466473/	The e-cigarette exploded in the owner's pocket.
Maesycwmmer, Wales, UK	September 2013	http://www.dailymail.co.uk/news/article-2430393/E-cigarette-wrecked-car-EXPLODED-like-firework-charged-overnight-leaving-seats-destroyed-windows-blackened.html	The e-cigarette exploded while being charged overnight in a car.

TABLE 1. *Continued.*

Location	Date	Source URL	Notes
Grant Park, GA	September 2013	https://web.archive.org/web/20140209043157/http://www.wsbtv.com/news/news/local/woman-says-e-cigarette-exploded-shot-flames-4-feet/nZkCX/	The e-cigarette exploded during charging.
Provo, UT	September 2013	https://newsone.com/2724915/e-cigarette-fire-utah-kinzie-barlow/	The e-cigarette exploded during charging in a car and caused burn injuries to a 3-year-old boy.
Binghamton, NY	September 2013	http://ecigone.com/featured/e-cigarette-explosions-comprehensive-list/	The e-cigarette exploded during charging.
Oklahoma City, OK	August 2013	http://kfor.com/2013/08/01/e-cigarette-explodes-and-sparks-small-fire/	The e-cigarette exploded during charging.
Cardiff, UK	August 2013	https://www.e-cigarette-forum.com/forum/threads/vapouriz-fire-hazard.456647/	The e-cigarette exploded during charging.
Tulsa, OK	July 2013	http://www.newson6.com/story/22536957/tulsa-mans-e-cig-caughts-fire-while-charging	The e-cigarette exploded during charging.
Sherman, TX	June 2013	http://www.kxii.com/news/headlines/E-cigarette-explodes-in-Texoma-mans-home-215771641.html	The e-cigarette exploded during charging.
Oklahoma City, OK	April 2013	http://www.koco.com/article/police-explosion-at-apartment-complex-came-from-e-cigarette/4292972	The e-cigarette exploded in an apartment.
Glendale, AZ	April 2013	http://www.cbs5az.com/story/22066822/unattended-electronic-cigarette-charger-explodes-car-caughts-fire	The e-cigarette battery exploded during charging in a car.
Corona, California	March 2013	http://www.latimes.com/local/crime/la-me-ecigarette-burns-verdict-20151001-story.html	The e-cigarette exploded in the owner's pocket.
Niceville, FL	February 2012	http://www.cbsnews.com/news/electronic-cigarette-explodes-in-mans-mouth-causes-serious-injuries/	The e-cigarette exploded in the owner's face during usage causing severe burn injuries.
Bristol, UK	November 2011	https://www.e-cigarette-forum.com/forum/threads/e-cig-charger-set-on-fire.242903/	The e-cigarette battery exploded during overnight charging.

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SAURABH SAXENA received the B.Tech. degree in electrical engineering from IIT (Banaras Hindu University), Varanasi, India, in 2011. He is currently pursuing the Ph.D. degree with the CALCE Center, University of Maryland at College Park. He was a Project Assistant with IISc Bangalore, India for 10 months on a project related to the modeling of Li-ion batteries and ultracapacitors. He has been involved in various battery projects for last five years. His research interests include the design of battery management systems and failure analysis, testing, reliability, safety, and the prognostics of lithium-ion batteries.



LINGXI KONG received the B.E. degree in material moulding and control engineering from Sichuan University, Sichuan, China, in 2013, and the M. Eng. degree in material science and engineering from the University of Maryland at College Park, College Park, MD, USA, in 2015, where he is currently pursuing the Ph.D. degree in mechanical engineering with the Center for Advanced Life Cycle Engineering. His research interests include lithium-ion battery testing and failure analysis.



MICHAEL G. PECHT (S'78–M'83–SM'90–F'92) received the B.S. degree in physics in 1976, the M.S. degree in electrical engineering in 1978, and the M.S. and Ph.D. degrees in engineering mechanics from the University of Wisconsin–Madison, Madison, WI, USA, in 1979 and 1982 respectively.

He is the Founder and currently the Director of the Center for Advanced Life Cycle Engineering, University of Maryland at College Park, College Park, MD, USA, which is funded by over 150 of the world's leading electronics companies at over U.S. \$ 6 million/year. He is also a Chair Professor of mechanical engineering and a Professor of applied mathematics, statistics, and scientific computation with the University of Maryland. He has authored over 20 books and 400 technical articles, and holds eight patents.

He is a Professional Engineer and a fellow of the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the International Microelectronics Assembly and Packaging Society. He has also served on three U.S. National Academy of Science studies, two U.S. Congressional investigations in automotive safety, and as an expert to the U.S. Food and Drug Administration. He is the Editor-in-Chief of the IEEE ACCESS, and he served as a Chief Editor for the IEEE TRANSACTIONS ON RELIABILITY for nine years and *Microelectronics Reliability* for 16 years.