

# Cigarette Filters

Source: [Clean Virginia Waterways](#)

## What are cigarettes and filters made of?

Cigarettes are made from four components, each of which is described below:

1. Filters
2. Tobacco
3. Additives
4. Cigarette wrapper

Cigarettes today are typically 85 or 100 mm long, and have diameters of about 8 mm. Their filters are usually 20 to 30 mm long, so a typical cigarette has 55 to 80 mm of tobacco.

### 1. Filters:

Cigarette filters are specifically designed to absorb vapors and to accumulate particulate smoke components. Filters also prevent tobacco from entering a smoker's mouth and provide a mouthpiece that will not collapse as the cigarette is smoked. Filters generally have the following components:

- **A "plug" of acetate cellulose filter tow**  
95% of cigarette filters are made of cellulose acetate (a plastic), and the balance are made from papers and rayon. The cellulose acetate tow fibers are thinner than sewing thread, white, and packed tightly together to create a filter; they can look like cotton. Other materials have been tried and rejected in favor of the taste that acetate produces. Filters vary in filtration efficiency, depending on whether the cigarette is to be "light" or regular.

### How many fibers are in a cigarette filter?

*The following is quoted from a research paper by researchers from the New York State Department of Health, the Roswell Park Cancer Institute, and Cornell University. [Click here](#) for full article.*

"Viewing the white face of the cigarette filter with the naked eye and compression of the filter column with the fingers would suggest that the filter is made of a sponge-like material. However, opening the cigarette filter, by cutting it lengthwise with a razor, reveals that it consists of a fibrous mass. Spreading apart the matrix reveals some of the more than 12 000 white fibers. Microscopically, these fibers are Y shaped and contain the delustrant titanium dioxide. The fibers are made of cellulose acetate, a synthetic plastic-like substance used commonly for photographic films. A plasticiser, triacetin (glycerol triacetate), is applied to bond the fibers."

- **An inner paper wrapper (plug wrap) and glue**  
The paper used to wrap the acetate cellulose plug is impervious to air for regular cigarettes, or is ventilated and very porous in "light" cigarettes, allowing more air to enter the smoke mix. A polyvinyl acetate emulsion is used as the glue to attach the plug to the wrapper, and to seam the wrapper.

- **An outer paper (tipping paper)**

The tipping paper, often printed to look like cork, covers the filter plug and attaches the filter to the column of tobacco. Tipping paper is formulated to not adhere to the lips of smokers.

- **Other Filter components**

The filters of some cigarettes, such as Parliament, also contain charcoal as an additional filtration agent. The "micronite filter" on Lorillard's Kent brand cigarettes from 1952 to 1957 contained the deadliest form of asbestos - crocidolite. While advertisements at the time promoted the filter as making Kents healthier than other cigarettes, there are currently several lawsuits pending against Lorillard from families of smokers who died from a rare cancer caused primarily by crocidolite.

## **2. Tobacco and Nicotine in Cigarettes:**

Cultivated tobacco, *Nicotiana tabacum*, is a member of the nightshade family of plants. It is a broadleaf native of tropical America that is cultivated as an annual. Depending on the type of tobacco and its growing location, the leaves of the tobacco plant have different tastes, burning properties, aromas, color, and nicotine content. Tobacco leaves contain several alkaloids (see below), including the highly toxic alkaloid nicotine. Nicotine is the drug in tobacco that causes addiction in smokers according to the US Department of Health and Human Services.

Nicotine is a powerful insecticide and among the deadliest of all plant products in its pure form. According to the US Department of Health and Human Services, it raises blood pressure, affects the central nervous system, and constricts blood vessels in humans. Nicotine is a colorless liquid that is highly soluble in water, and is readily absorbed through the skin in its pure form.

## **3. Additives to tobacco:**

Potentially hundreds of additives are mixed with tobacco during the manufacturing process. Additives to smoking tobacco include flavorings and humectants that are used to keep tobacco moist. According to a publication written for the tobacco industry, additives can constitute ten percent of the weight of the "tobacco" portion of a cigarette, and four per cent of the entire cigarette.

The complete list of 1,400 potential tobacco additives, which include sweeteners and flavors such as cocoa, rum, licorice, sugar, and fruit juices is considered a trade secret. Since tobacco is not classified as a food or drug, there are no legal maximums on agricultural chemicals or chemical additives cigarettes may contain.

A widely used cigarette additive is menthol with its ability to provide flavor and to serve as an anesthetic. When burned, many additives form new compounds, possessing unique properties. For example, glycerol produces acrolein, a chemical which has been found to interfere with the normal clearing of the lungs (Whelan, 1984)

- **"Tar" in cigarette filters:**

The "tar" often referred to in connection with cigarettes is not a black petroleum tar product, but instead refers to the hundreds of substances and additives found in tobacco. Tar, when cool, is a sticky yellow-brown substance and the U.S. Department of Health and Human Services states that it is composed of organic and inorganic chemicals, including some carcinogens. The U.S. Federal Trade Commission defines tar as "total particulate matter...less nicotine and water."

- **Contents of Cigarette Smoke:**

When smoked, the tobacco and additives in a cigarette undergo complex chemical processes to form smoke that contains more than 4000 chemicals, including carbon monoxide, hydrogen cyanide, nicotine, ammonia, arsenic and vinyl chloride (U.S. Department of Health and Human Services, 1989). Forty-three constituents of tobacco smoke are known carcinogens including nitrosamines, quinoline, benzpyrene, cadmium, ammonia, nitrogen dioxide, formaldehyde, hydrogen cyanide, arsenic, and hydrogen sulfide (U.S. Department of Health and Human Services, 1989, and other sources).

- **About Alkaloids:**

According to The Concise Oxford Dictionary of Botany (editor: Michael Allaby, 1992), alkaloids are ... "A group of basic, nitrogenous compounds of a complex nature. Alkaloids are derived from plants and have powerful pharmacological effects. More than 1000 alkaloids are known from 1200 plants species. Their function is uncertain but in some species, they confer a degree of protection from insect attack. Pharmacologically powerful alkaloids derived from plants include cocaine, morphine, and strychnine."

#### **4. Cigarette Wrapper and Glue**

Generally, the paper used to wrap the tobacco is made from flax or linen fiber. Manufacturers add various chemicals to the paper, including salts, monoammonium phosphate and sodium and potassium citrates to accelerate or control the burning rate. The burn rate has an important effect on the number of puffs that can be obtained by the smoker, and the smoke yield. A whitening pigment—calcium carbonate—is added to the paper, partly to ensure the creation of an attractive ash as the cigarette burns (Browne, 1990). The wrappers' seams are glued with an adhesive that is a modified starch or natural gum (Browne, 1990).

[Click here for newspaper articles](#) about how communities are trying to reduce cigarette litter.

#### **Read all about cigarette butt litter!**

[Click here to read an article](#) that was published in the August 2000 issue of the American Littoral Society journal, *The Underwater Naturalist*. This article, by CVW's Executive Director Kathleen M. Register, includes background data, such as the fact that 2.1 billion pounds of cigarette filters were discarded worldwide in 1998, along with results of her research showing that leached chemicals from cigarette filters are deadly to the water flea *Daphnia magna*, a small crustacean at the lower end of, but important to the aquatic food chain.

[Return to Cigarette Butt Litter Home Page](#)

[Return to Clean Virginia Waterways](#)

Compiled by Clean Virginia Waterways, Longwood University, Farmville, VA 23909  
434-395-2602 Fax: 434-395-2825 Email: [cleanva@longwood.edu](mailto:cleanva@longwood.edu)

#### **Students and Teachers:**

Are you interested in doing a science fair project on cigarette litter?

[Click here for ideas and information.](#)