



## European Candle Association ASBL

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### **Particle emissions from candles are no health hazard**

*Just like any other open combustion, candles emit fine particles but do not pose a health hazard if some rules are respected.*

From time to time, the media reports on the high emission of fine particles from candles and the supposed health hazard connected with it. If some basic rules for handling candles are respected, such concerns can be easily dispelled however.

#### **What is fine dust?**

Fine dust or particulate matter describes particles that can penetrate the deeper part of the lungs because of their small size and, depending on their composition, may remain there. Possible sources of fine dust can be traffic (diesel particles, tire abrasion, suspended road dust), cooking or open fire (tobacco smoke, open fireplaces) for example. Burning candles produces fine dust too – but besides the particle size and the total fine dust quantity, the evaluation of a possible health risk has also got to take the composition of the particles into account.

#### **Do candles emit fine particles?**

A lot of scientific studies covering this topic have been published during recent years. A study of scientists from the University of Lund (Sweden) <sup>1)</sup> is especially noteworthy since it gives an overview of previous studies on candles on the one hand and additionally examines the size, number and composition of emitted particles from steadily burning candles, sooting candles and candles after having been extinguished.

In contrast to other open combustions like wood fires in open fireplaces for example, the flame of a steadily burning candle shows very high temperatures. This is the reason why the candle wax is combusted almost completely and no or only extremely small amounts of pollutants are emitted - ranging far below any critical concentration. One study confirming this fact is a scientific comparison of candles made of different wax types performed by the German Bayreuth Institute of Environmental Research (Ökometric GmbH) in 2007. A study summary can be obtained on request and is available on [www.eca-candles.eu](http://www.eca-candles.eu).

The undesired incomplete combustion, during which also pollutants can be emitted, can be recognized by a flickering flame or the visible release of soot. It can be caused by insufficient oxygen supply or because the candle is placed in a draught.

If the candle flame is not extinguished with a candle snuffer but blown out instead, there is also an incomplete combustion taking place during the short afterglowing phase.

## Findings of the scientific studies

The study of the Lund University examines the size, number and composition of the emitted particles during exactly these possible candle burning phases.

If a candle is burning with a steady flame, it emits a comparably high number of ultrafine particles. This does not pose a health hazard however. The key is the composition of the particles: they are inorganic water-soluble salts like phosphates for example, required to improve the wick performance. They easily agglomerate when exposed to air humidity what makes the deposition less probable. If these particles reach the lungs anyway, they are simply dissolved and released by the body.

In addition to these ultrafine particles, sooting candles also emit bigger particles mainly consisting of elemental carbon. These particles pose a lower health risk compared to soot particles from diesel exhaust however. They contain much less polycyclic aromatic hydrocarbons (PAH) for example – a pollutant category that is typically formed during incomplete combustion. In addition to this, the particles from burning candles quickly agglomerate to bigger particles that are clearly bigger than those in diesel exhaust, and so the probability that they are deposited in the respiratory tract is clearly lower.

In the period after blowing out the candle – characterized by an afterglowing wick tip and the release of a visible trail of smoke – mainly comparably big particles are formed that are composed of non-combusted or only partly combusted candle wax for the most part. These particles can be inhaled less easily and are also less critical than soot particles because of their composition.

## Summary

Despite steadily burning candles emit fine particles just like all other open combustions, this is not a matter of concern based on the state of the scientific knowledge because of the composition of the particles.

An incomplete combustion characterized by visible release of soot or smoldering after blowing out the candles should be avoided for reasons of precaution nevertheless although the concerns are, compared to other sources of fine dust like diesel exhaust or open wood fires, clearly smaller here as well. This can be achieved by respecting a few simple rules:

## Basic rules for handling candles

- Do only use high quality candles. Only these candles guarantee the use of premium quality base materials as well as an impeccable burning behavior. Such high quality candles can be identified by the RAL Quality Mark for Candles for instance:



- Do not place candles in a draught. A candle can only burn steadily and without emitting soot if the ambient air is calm. Extinguish the candle immediately if it soots regardless.

- Do only burn candles in appropriate candle holders allowing sufficient air supply.
- Trim the wick if it gets too long. The ideal length of the wick ranges from 10 to 15 mm, depending on the candle type. Longer wicks may cause sooting and should thus be carefully trimmed with scissors after extinguishing the flame.
- Carefully trim the edge of the candle if it gets too high by using a sharp knife when it is still warm. Do not damage the rim however because otherwise liquid wax may spill out.
- Do never blow out candles. Put the candle out by extinguishing the flame with a candle snuffer or by carefully dipping the wick into the liquid wax. Please straighten the wick up again afterwards.
- Ventilate the room after extinguishing the candles.

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<sup>1)</sup> Pagels, J., Wierzbicka, A., Nilsson, E., Isaxon, C., Dahl, A., Gudmundsson, A., Swietlicki, E., Bohgard, M. (2009). Chemical composition and mass emission factors of candle smoke particles. *Aerosol Science* 40 (2009), 193-208