

Characterization of particle emissions from candles

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Introduction

Danes have the highest consumption of candles in the EU, averaging 5.8 kg per person per year. This results in an increased concentration of particles in the indoor environment and potential health hazardous effects.

Aim

The objective was to get an impression of the particle emission from candles with a focus on respirable and ultrafine particles. Additionally, the amount of lead and nickel emitted from burning candles was quantified, and it has been clarified if a health related risk is involved when staying in a room with the investigated candles burning.

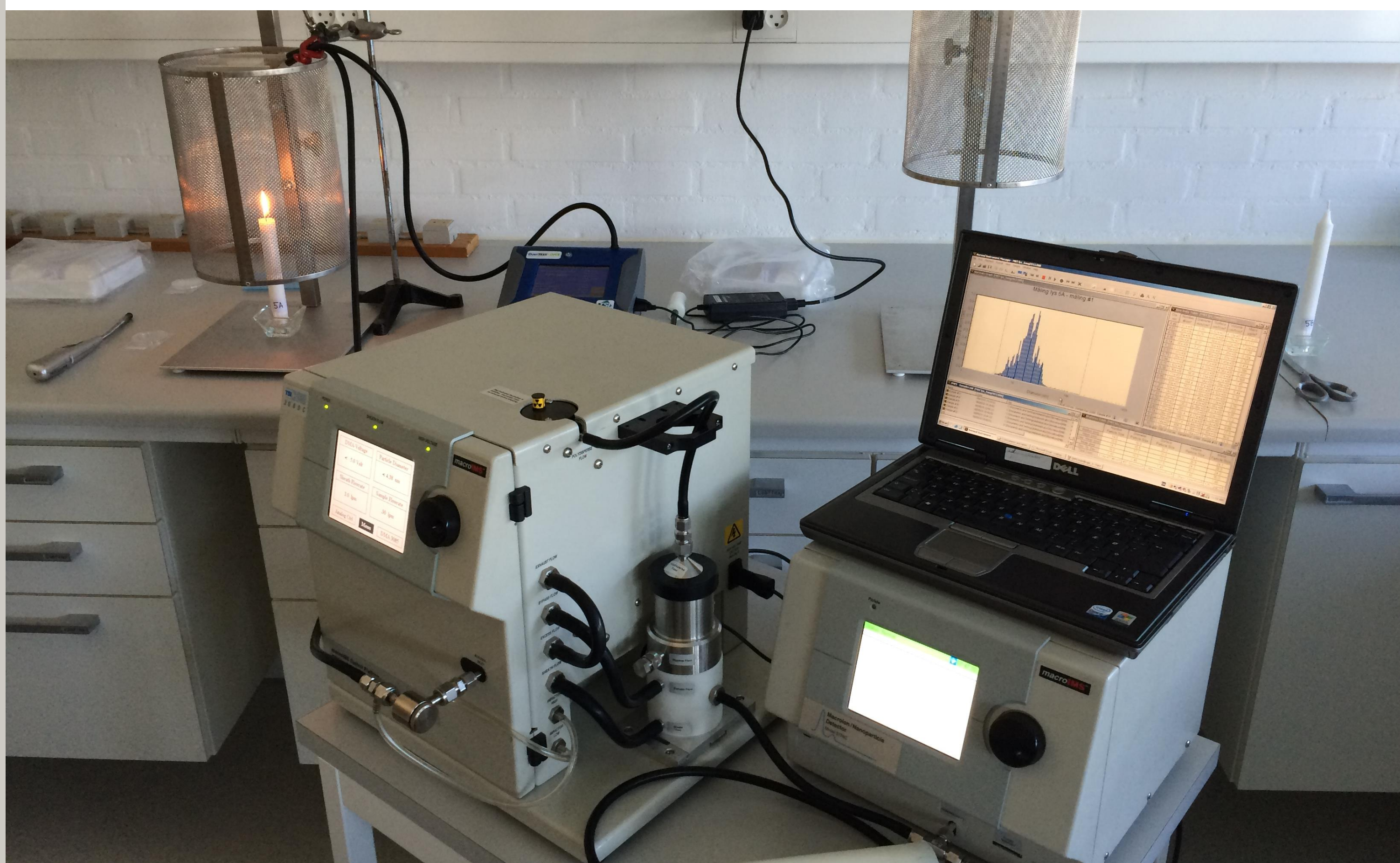
Methods

Initially, 129 different candles were identified on the Danish market, and among these 32 white candles were chosen for particle emission measurement and chemical content analysis.

The following methods were used:

- Particle number (PN) and size distribution (PSD) measured by TSI scanning mobility particles sizer (SMPS)
- Particle mass measured by TSI DustTrak
- Filter sampling for subsequent chemical analysis of emitted particles for content of lead and nickel

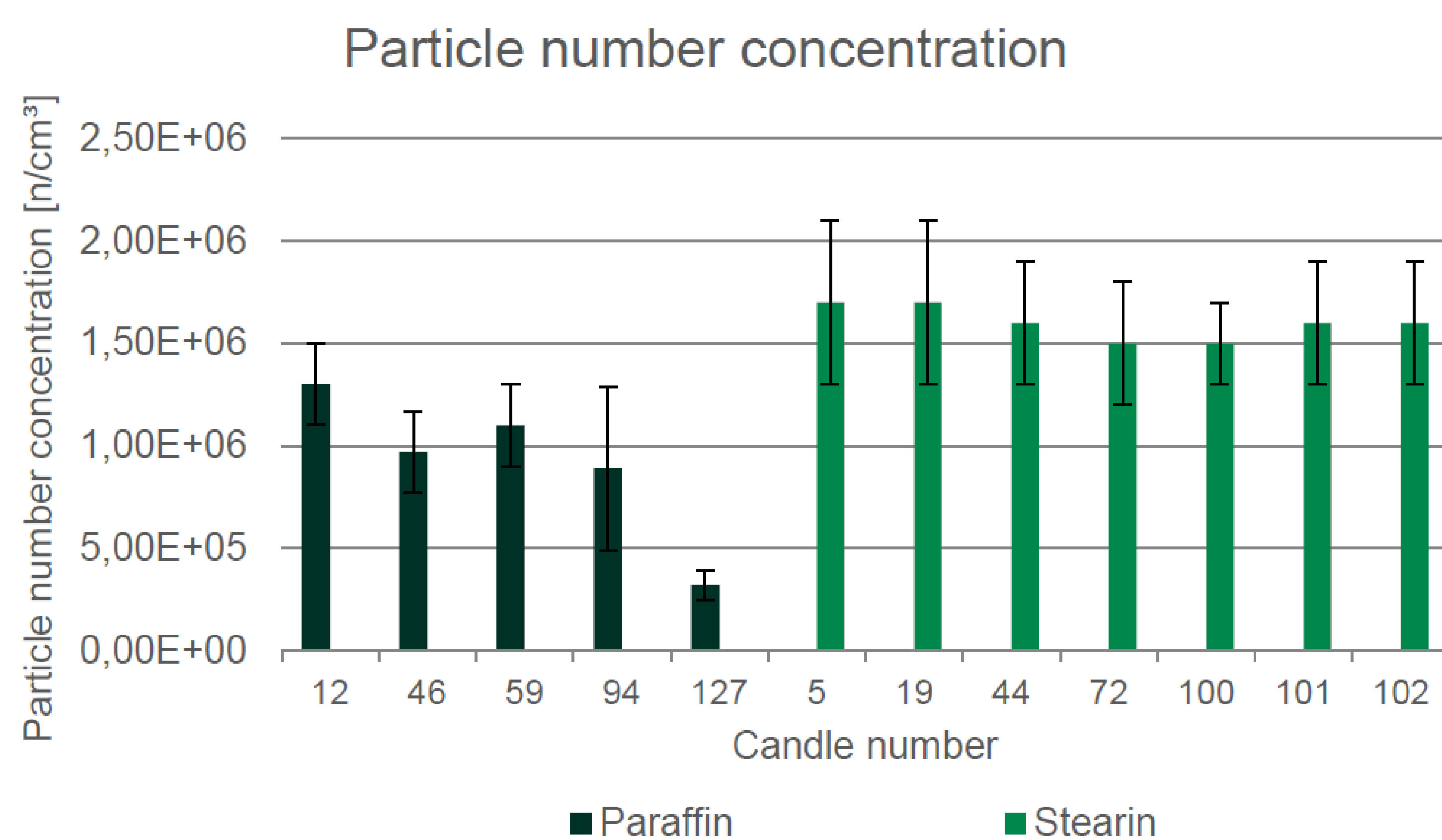
The candles were placed in a wire screen (EN 15426) and particle emissions were measured close to the candle and in the room. All measurements were carried out in a climate room.



Emission and chemical content

Two candles from each of the 32 candle types were analysed.

- Stearin candles generally emit twice as many ultrafine particles as paraffin candles (both source and room measurement)
- In the wick, lead was identified in 26 candle types and no nickel could be identified. In the wax, lead was identified in 4 candle types, and nickel was found in 2 candle types



Risk assessment

It is very uncertain to conclude that stearin candles are more critical than paraffin wax candles. More knowledge of the composition of the particles and additional toxicity data are required.

Conclusions

The burning circumstances are considered to be of greater significance than whether the candle is a stearin candle or paraffin candle. Therefore, highest priority should be given to selecting candles that burn with a steady and non-sooting flame.

A sooting candle can emit 30-70 times as many particles to the air compared to a non-sooting candle.

- White candles amounts to approximately 90% of the entire sale of candlesticks on the Danish market.
- During winter season, 6 out of 10 Danes daily or several times per week burn candles at home
- <http://mst.dk/service/publikationer/publikationsarkiv/2017/mar/survey-and-risk-assessment-of-particle-and-heavy-metal-emissions-from-candles/>

