

Indoor air pollution caused by ethanol fireplaces

Ethanol fireplaces are becoming increasingly popular

Ethanol fireplaces are becoming increasingly popular and find use in households. They are used for decoration, but also for heat generation. Manufacturers of such fireplaces promise consumers a complete combustion of bioethanol to carbon dioxide and water. Often, however, denaturants, dyes or other additives are added to the fuel so that a complete combustion of the fuel is hardly possible. Various studies have shown that ethanol burners release not only carbon dioxide and water into indoor air, but also other pollutants.

Ethanol fireplaces do not require technical approval by a chimney sweep since they do not have a fume extraction system. Many find this to be an advantage of using ethanol fireplaces, but it has a negative effect on indoor air quality. Pollutants generated during the filling of the fuel chamber and combustion of the fuel are thus directly transported into indoor air.



Ethanol Fireplace

Ethanol fireplaces influence indoor air quality

Various studies show that the use of ethanol fireplaces is a significant source of indoor pollution. The Fraunhofer Wilhelm-Klauditz-Institut has investigated four different ethanol fireplaces with eight liquid and gel-type fuels in a 48 m³ emission chamber. During the burning process, high concentrations of nitric oxide (NO), nitrogen dioxide (NO₂), carbon monoxide (CO) and carbon dioxide (CO₂) were measured. In addition, elevated concentrations of the carcinogenic substances benzene and formaldehyde in the waste air were measured. Frequently, the concentrations exceeded the indoor air guideline values set by the WHO and the German Committee on Indoor Guidelines. Also, high concentrations of fine and ultrafine particles were observed during the burn-out phase, irrespective of the fuel.

Other studies yielded similar results. In a study commissioned by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, two ethanol fireplaces - one floor and one table-top model - were investigated with three different fuels (liquid and gel). In this study too, significantly increased concentrations of CO and CO₂ were observed during operation. Concentrations of benzene and formaldehyde rose significantly after start-up. In addition, increased concentrations of ultra-fine particles (20 to 1000 nm) were observed, which increased sharply after start-up of the fireplace and remained at a constant level during operation.

A comparison of the results of the floor and the table-top model found that oven size and the mass of the fuel have an influence on pollutant concentrations in indoor air. Regarding the type of fuel, whether liquid or gel, no difference was found.

Guidance on the use of ethanol fire places

The studies show that thorough airing is not sufficient when ethanol fireplaces are in use. Larger ovens in particular should only be operated with the windows open or in larger rooms in order to reduce the pollution. For this reason, these types of fireplaces are not suitable for room heating. The manufacturer's statement that the ethanol fireplace complies with the requirements of DIN 4734-1 is not an indication of a low-emission product. This standard only sets emission testing requirements for CO and CO₂ and does not consider substances such as benzene and formaldehyde which are harmful to health.

The above-mentioned substances can be taken up by humans via the respiratory tract and then exert various adverse effects in the body. For instance, they can cause mucous membrane irritation or have a narcotic effect on the central nervous system.



Flame of an ethanol fireplace

The Indoor Air Hygiene Commission of the German Environment Agency advises against the use of ethanol fireplaces.

Further information

- ▶ [Chamber studies on nonvented decorative fireplaces using liquid or gelled ethanol fuel](#)
[Kurzlink: <http://1.usa.gov/20qgmDD>]
- ▶ [Innenraumschadstoffe durch Verbrennungsprozesse: Ethanol- und Speicheröfen](#)
[Kurzlink: <http://bit.ly/1QFR1OB>]
- ▶ [Einfluss von offenen Ethanolbrennstellen auf die Luftqualität in Passivhäusern](#)
[Kurzlink: <http://bit.ly/1QcAdvj>]

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