Cooking with condiments an important source of terpenes in indoor environments

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Cooking processes are one of the main sources of non-methane organic gases (NMOG) and particulate matter (PM) in non-smoking households and restaurants, with obvious implications for public health. There are indications that cooking with condiments generates considerable terpene emissions (Klein et al., 2016), which could act as a source of secondary organic aerosol (SOA) in indoor environments. So far terpene emissions in indoor environments and the SOA produced from it were mostly attributed to cleaning detergents or scented candles use (Kephalopoulos, 2007).

In this work we used a highly sensitive measurement setup involving a high-resolution time-of flight aerosol mass spectrometer (HR-ToF-AMS) for particle measurements, a high resolution proton transfer time-of-flight mass spectrometer (PTR-ToF-MS) for gas-phase measurements and a two-dimensional gas chromatography time-of-flight mass spectrometer (GC×GC-ToF-MS) for compound identification. We fried beef with different amounts of condiments and introduced the emissions into a Teflon smog chamber. The emissions were aged and their SOA production potential was assessed.

Our measurements show that cooking with condiments releases significant amounts of terpenes (Fig. 1). Depending on the condiments used (Herbs de Provence or black pepper) different amounts of monoterpenes (e.g. a-pinene, p-cymene, d-limonene), sesquiterpenes (e.g. b-caryophyllene, a-cubene) and diterpenes (e.g. cembrene, rimuene) as well as terpenoids (e.g. camphor, thymol, phytol) are emitted. The amount of terpenes emitted is clearly correlated with the amount of herbs added to the meat.

In this study we present PM and NMOG emission factors of frying food with condiments. We identify the emitted terpenes and show the relationship between the amount of condiments added and the terpene emissions. We describe the SOA production potential of these specific cooking emissions and evaluate the impact of terpene emissions and their subsequent SOA production on indoor air quality.

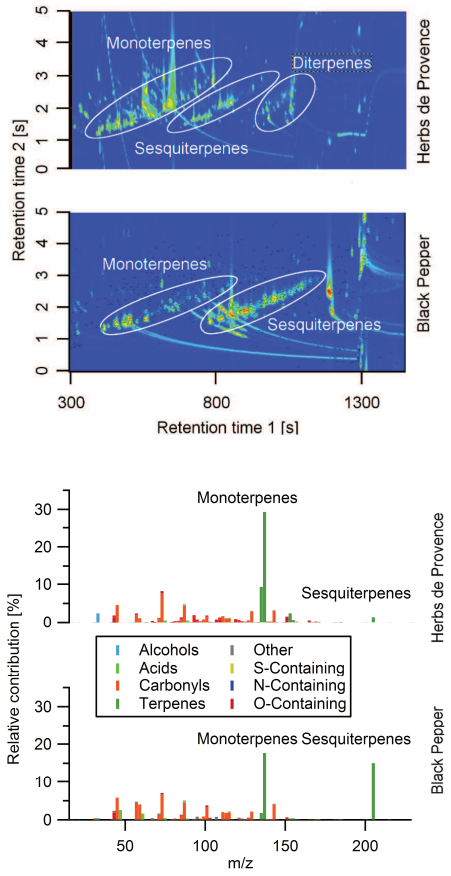

Figure 1. Two-dimensional GC×GC-ToF-MS traces of heated herbs de Provence or black pepper (upper panels) and PTR-ToF-MS mass spectra of frying beef with herbs de Provence or black pepper (lower panels).

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Kephalopoulos, S. Impact Of Ozone-Initiated Terpene Chemistry On Indoor Air Quality And Human Health. European Commission, 2007. Web. 1 Mar. 2016.

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