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Potential of ptr-tof-ms for measuring the boar taint Components: androstenone, skatole and indole

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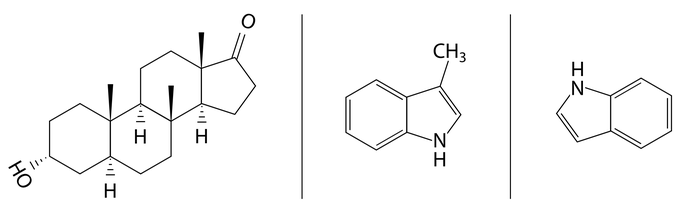
Introduction

In the future it is likely that castration of pigs will cease. An affordable system for rapid measurement of the boar taint compounds: skatole, indole and androstenone (see Figure 1) should be developed for the slaughter industry to sort carcasses according to their content of these compounds.



Androstenone. M = 272.4 amu, mp = 182

Skatole. M = 131.2 amu, mp = 95 °C

Indole. M = 117.2 amu, mp = 54 °C

Figure 1.

The Danish Meat Research Institute has tested the ability of the Ionicon PTR-TOF-MS (Proton Transfer Reaction – Time of Flight – Mass Spectrometer) for measuring the presence of the three boar taint compounds in the headspace above a fat sample in a closed vial. The PTR-TOF 8000 from Ionicon was designed especially for quantifying sub-ppbv amounts of volatile organic compounds (VOC).

Materials and methods

In Figure 2 is shown a typical mass spectrum of the headspace air from a fat sample at room temperature. Already at low temperatures the headspace contains a very complex mixture of compounds.

Samples

Fat samples from 14 entire male pig carcasses were analysed both with the PTR-TOF-MS and using the HPLC based ASI method which is DMRI's basic reference method for skatole, indole and androstenone.

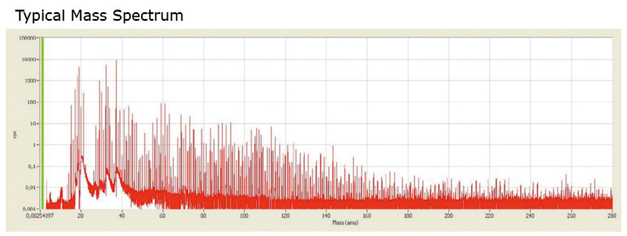


Figure 2: In a time of flight mass spectrometer as in the PTR-TOFMS, the ionized compounds are accelerated in an electric field. The achieved velocity depends on the mass of the ion and its electric charge. Thus, the time required for the ion to travel a certain distance will uniquely identify it. The PTR-TOF-MS requires no inlet membrane which is an advantage when working with sticky compounds like androstenone.

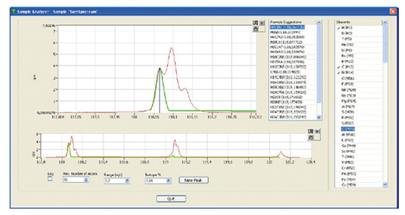


Figure 3 shows a time segment from a measurement where signals from almost identical masses overlap.Even partially overlapping signals can be resolved.

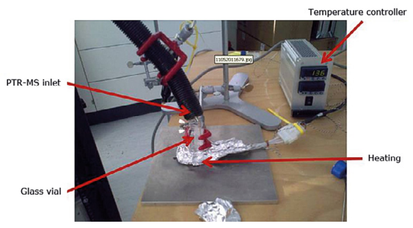


Figure 4: Headspace sample is drawn from a small vial. Sample temperature is 160 - 180 °C. for releasing relevant VOC's.

PTR-TOF-MS results

In Figures 5 and 6 the ion yield is shown for skatole and indole respectively corresponding to the masses shown in Figure 1.

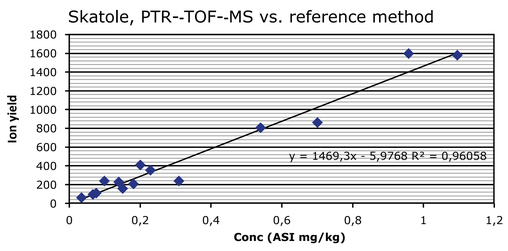


Figure 5

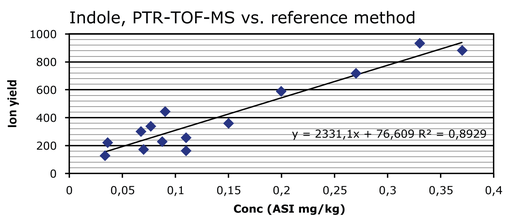


Figure 6

Conclusion

The PTR-TOF-MS was successfully tested for measuring indole and skatole in the headspace above the back fat. Work needs to be done for further improvement of the sample conditioning allowing at-line use of the method. Preliminary studies have shown that PTR-TOF-MS is capable of measuring androstenone, which is a much larger molecule than skatole.

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