

Formaldehyde Detection using PFPH and Thermal Desorption

Application Note Tobacco

Author:

C. Zawodny

Formaldehyde is a chemical widely used in industry, including the manufacture of construction materials as well as certain household products. It has been identified as a health hazard causing eye and throat irritation along with it being a suspected carcinogen.

Detection of formaldehyde has been done using liquid chromatography and 2,4-dinitrophenyl hydrazine derivatives of the suspected gaseous carbonyl compound. Solvent extraction of the 2,4-DNP-Hydrazones and analysis by LC completes the analysis.

Table 1 lists the most prominent aroma compounds collected from the cereal. Compounds include aldehydes like hexanal and decanal, terpenes like pinene and limonene, alcohols, acetic acid and butylated hydroxytoluene (BHT), an antioxidant.

The use of Pentfluorophenyl Hydrazine (PFPH) coated Tenax enables qualification of formaldehyde present in liquids using thermal desorption and GC/MS to detect the resulting hydrazone derivative. To coat the tube, a standard 6 mm Tenax packed sorbent tube was placed in a graduated cylinder (25 ml), and a solution of 2000 ppm of PFPH in hexane was added so that the tube was covered. After about five minutes, the tube was removed and placed (frit first) into a Dynatherm Model 60 Tube Conditioner using its spiking stand. Helium (50-100ml/min) purged the tube until no further hexane liquid was expelled. With the helium flow still on, a 38 ppm standard of formaldehyde in water was spiked onto the tube which was removed after about two minutes. The tube was placed into a CDS 9300 TDA station and thermally desorbed at 150°C for 15 minutes to transfer the analytes to an Agilent 6890 GC with an Agilent 5975 as the detector.

Instrument Conditions

Dynatherm 9300

Valve Oven: 275°C
Transfer Line: 250°C
Tube Idle: 40°C
Tube Heat: 100°C 5.00 Minutes
Tube Cool: 0.00 Minutes
Trap Idle: 40°C
Trap Heat: 275° 5 Minutes

Gas Chromatograph

Column: VF 5MS (30m x 0.25mm x 0.25µm)
Detector: Quadrupole MS
GC Program: 7°C to 100°C, 8°C to 250°C (Hold 2 Min)
GC Delay: 14.9 Minutes

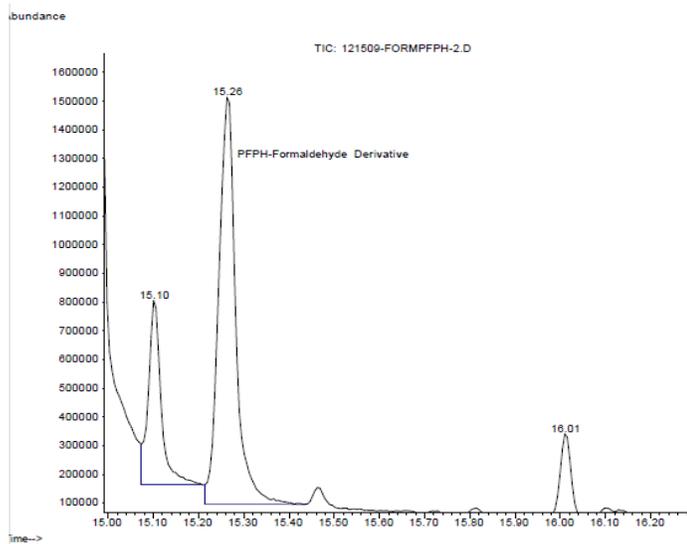


Figure 1. PFP-Formaldehyde Hydrazone.

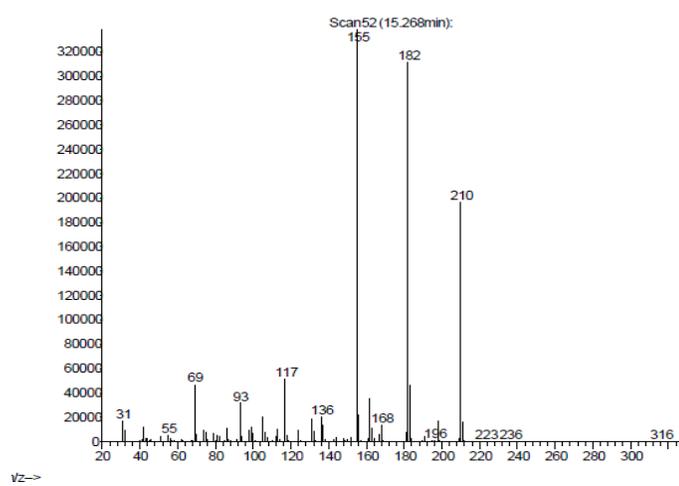


Figure 2. Mass spec of the derivative.

FOR MORE INFORMATION CONCERNING THIS APPLICATION, WE RECOMMEND THE FOLLOWING READING:

HO and YU, Environ. Sci Technol, 2004, 38, 862-870