Volatile Analysis of Kraft Paper Products Using Thermal Desorption

Application Note
Paper & Ink

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Paper pulp is produced by the Kraft (or sulfate) process. The process uses sodium hydroxide and sodium sulfide to digest the lignin from the wood. This process accounts for about 80% of paper production. The sulfite process accounts for the other portion of paper pulp. It uses calcium bisulfite and sulfur with the disadvantage that it it is more corrosive on the production equipment.

A number of malodorous compounds are formed in utilizing the Kraft process for paper production. The list includes hydrogen sulfide, methyl mercaptan, dimethyl sulfide,dimethyl disulfide as well as a number of other volatile organic compounds.

Various types of Kraft paper products (box cardboard, Kraft paper bags, pizza boxes) were cut into 4cm x 0.5cm strips. The strips were slightly moistened to aid in releasing components from the strip. Each sample was placed into individual empty thermal desorption tube and desorbed at 200°C/8 minutes to a sorbent trap. The trap was thermally desorbed at 275°C/5minutes to the gas chromatograph.

Figure 1 is a chromatogram of a Kraft packaging box (pizza box). A number of Kraft process compounds were detected including a Thiophene (1), a Thiolic Acid (2), Dimethyl Disulfide (3), and a substituted Furan (4). Figure 2 is a chromatogram of a Kraft processed brown paper bag. Detected compounds include substituted Furans (2,7), an Alkyl Hydroperoxide (1) a delignification of lignocellulose material, Cyclic Ketones (3,4,6), and a Methoxy Phenol (5).

Volatile analysis of Kraft as well as other processed paper products using Thermal Desorption is a clearly viable analyical technique.Sample preparation is minimal with relatively rapid analysis.

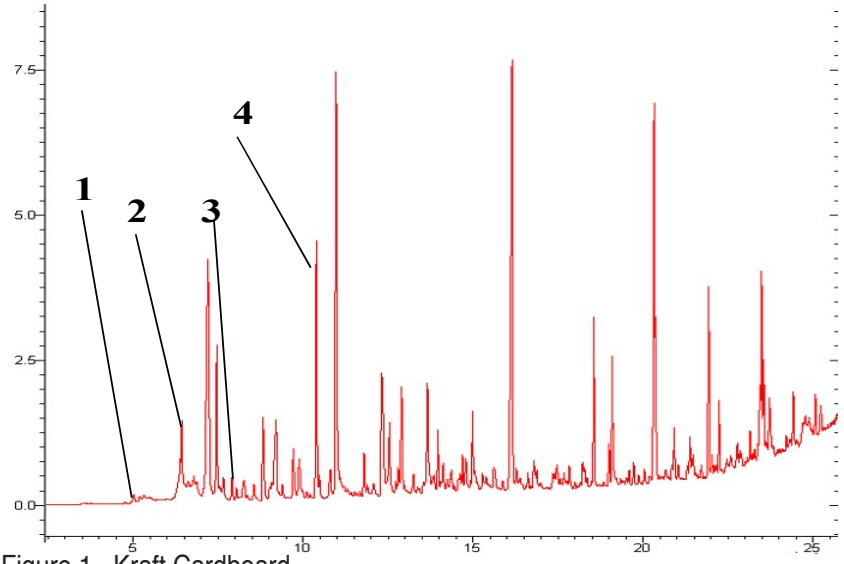

Figure 1. Kraft Cardboard

CDS Autosampler Dynatherm 9300

Valve Oven: 250°C
Transfer Line: 275°C
Vessel Heat: 250°C 5 minutes
Trap Heat: 275°C 5 minutes
When using an empty thermal desorption tube for "headspace" analysis, it is important to not heat a sample past its melting point.

GC/MS

Column: CP-Select 624
(30m x 0.25mm x 1.4μm)
Carrier: Helium, 50:1 split
Injector: 250°C
Program: 40°C/2min, 10°C/min to 220°C,

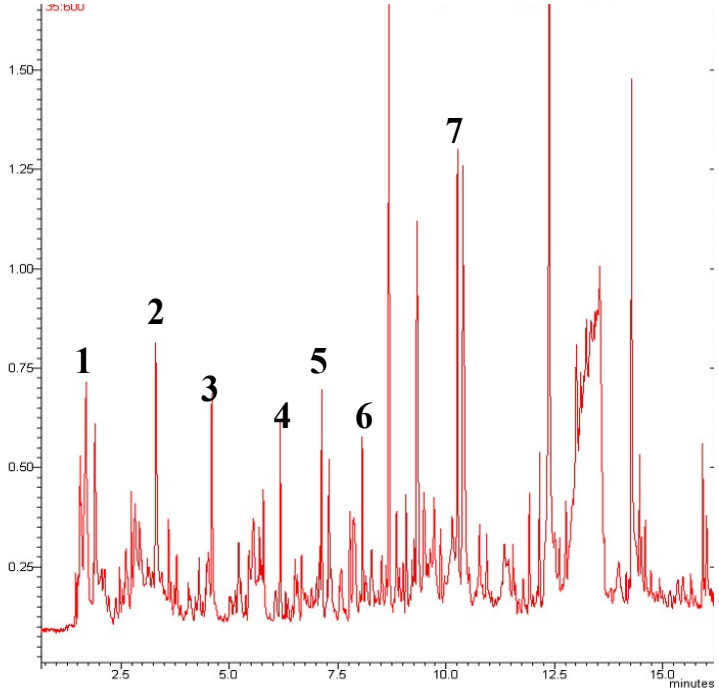

Figure 2. Kraft Brown Paper