

Gas Chromatography

Thermal Desorption Classic Applications

Thermal Desorption Applications No. 26

Thermal Desorption of Volatiles from Food Packaging Film

A number of solvents may be present in inks used in the production of printed packaging film. This film may be used to wrap biscuits and other groceries, and careful monitoring is required to ensure that these solvents have no effect on the flavour and colour of the food contained in the film.

Conventional analysis of this type of sample may involve time-consuming sample preparations and presents a variety of problems. Selection of a solvent which will dissolve the desired components but not interfere with the analysis is often difficult, whilst solvent extraction can result in dilute extracts. Impurities from the solvent and/or solvent tailing may also interfere if trace analysis is required.

The ATD 50 Automatic Thermal Desorption system is ideally suited for the determination of volatiles in solid samples. The method employed is simple: a known area of packaging film is inserted into an empty ATD 50 sample tube which is then heated to desorb the volatile components for analysis by gas chromatography. No other sample preparation is required.

This application note describes a method for the determination of ethanol, isopropanol, ethylacetate, tetrahydrofuran (THF), n-propylacetate (NPAC), toluene and epoxy propanol (EP), present in trace quantities in a printed packaging film.

Instrumentation

The ATD 50 Automatic Thermal Desorption system fitted with the multiple splitter accessory was connected to a Model 8500 gas chromatograph, with integral screen graphics and data handling. The results and chromatogram were plotted on a GP-100 printer plotter.

Method

50 cm² sections were cut from four separate sheets of printed packaging film. Each section was rolled up and inserted into a stainless steel sample tube (Figure 1).

The ATD 50 was fitted with a multiple splitter accessory and the split ratio set at 600:1, allowing sample introduction into a fused silica capillary column without any apparent column overload.

The system was calibrated by injecting 0.9 μ L of an equi-volume mixture of nine solvents into an ATD 50 tube packed with a short bed of Chromosorb 102. The results were calculated directly in milligrams per metre² film in the chromatogram report.

Four samples were analyzed and the peak area of solvent detected was measured using the integral data handling of the Model 8500 gas chromatograph. Full analytical conditions are given in Figure 2, whilst Figure 3 shows a chromatogram of the volatiles present in a sample of printed packaging film.

Figure 1. Film loaded into the sample tube

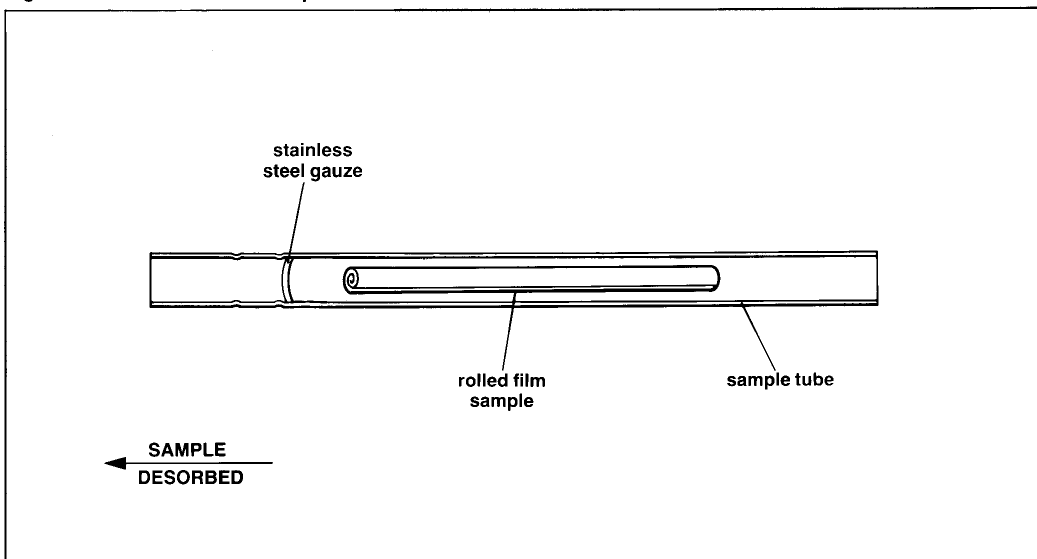


Figure 2

ATD 50 Conditions		GC Conditions	
Sample:	50 cm ² segment of printed packaging film	Instrument:	Model 8500
Mode:	2	Column:	25 m x 0.22 mm i.d. 0.25 μm film thickness fused silica column, bonded phase BP10
Primary desorption temp:	120 °C	Carrier gas:	Helium at 16 psig
Primary desorption time:	5 minutes	Oven temp:	Initial temp. 40 °C for 7 minutes, programmed for 15degC/min to 50 °C, followed by 30degC/min to 110 °C, held for 3 minutes
Transfer line temp:	150 °C	Detector:	FID
Cold trap low temp:	-30 °C	Detector temp:	250 °C
Cold trap high temp:	300 °C	Detector sensitivity:	High
Inlet split flow:	130 mL/min	Attenuation:	x128
Purge flow:	7 mL/min		
Column flow:	1 mL/min		
Outlet split flow:	30 mL/min		
Inlet split ratio:	130:8		
Outlet split ratio:	37:1		
Total split ratio:	600:1		
Analysis time:	20 minutes		

Results

The amounts of solvents present in the packaging film in milligrams per metre² were reported as follows:

Sample	Ethanol	Iso-propanol	Ethyl-acetate	THF	NPAC	Toluene	EP
1	5.35	1.02	10.03	0.80	2.36	0.65	5.14
2	5.86	1.08	11.23	0.93	3.15	0.95	11.46
3	6.01	1.10	10.61	0.85	4.23	0.83	15.23
4	5.63	1.85	9.87	1.39	3.90	1.15	10.69

Minimal sample preparation was required, the analysis time for each tube was 20 minutes and up to 50 samples could be analyzed automatically.

Conclusion

The combination of the ATD 50 with multiple splitter accessory and the Model 8500 with integral data handling provides an excellent system for the determination of solvents in food packaging.

Figure 3. Solvents present in printed packaging film

