Detecting Differences in PEEK Preparation

Application Note
Plastics

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Pyrolysis, a good technique for competitive analysis, quickly yields information on subtle differences between polymers. In this application note, we spot small differences in two poly ether ether ketone (PEEK) samples.

PEEK is high-strength, radiation-resistant plastic. Thermally stable and highly resistant to chemicals, it is used in machine parts, nuclear power-plant equipment, automobile parts, aerospace components, cable insulation, and medical implants.

Figures 1 and 2 are pyrograms of 2 different PEEK samples. Although largely similar, (they both contain typical pyrolysis products of PEEK such as benzene, phenol, biphenyl, fluorene, and diphenyl methanone), we can see tiny differences between the them. The first PEEK sample has siloxanes (peak #s 2 and 4).

The second sample instead has diflurobenzophenone, dichlorobenzophenone, and diphenyl sulfone (DPS). These products could be residual starting components or solvent. One way of making PEEK involves reacting benzenediol's di-potassium salt with difluorobenzophenone using DPS as a solvent.

Using pyrolysis can make work in the lab easier by providing a quick, simple way for competitive analysis. With almost no sample preparation, you get a complete profile of the unknown polymer, and clues as to how it was made.

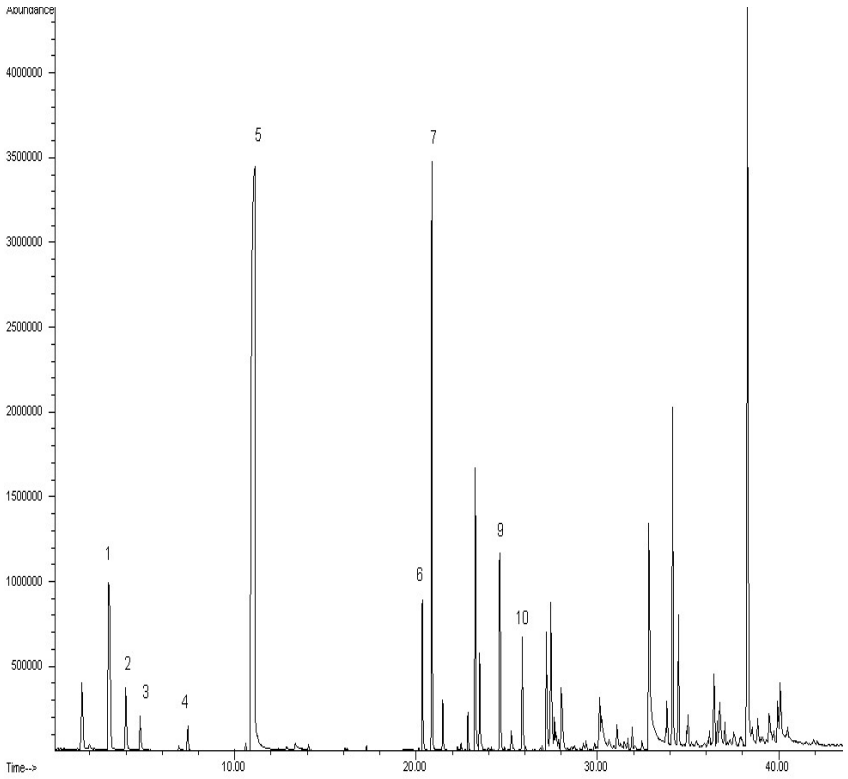

Figure 1. PEEK Sample 1

Instrument Conditions
Pyroprobe

Pyrolysis:	750°C 10 seconds
Interface:	300°C
Valve Oven:	250°C
Transfer Line:	290°C

GC/MS

Column:	35% phenyl (30m x 0.25mm)
Carrier:	Helium, 50:1 split
Injector:	300°C
Oven:	40°C for 2 minutes
	7°C/min to 300°C, hold 5 min
Mass Range:	35-550

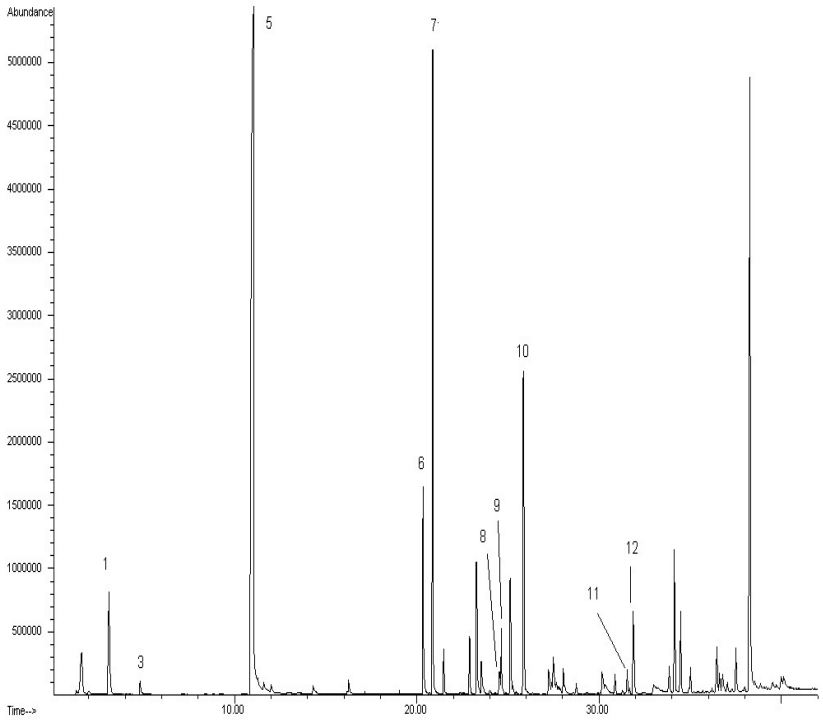

Figure 2. PEEK Sample 2

Peak Identification

1. Benzene
2. Hexamethyl Cyclotriloxane
3. Toluene
4. Octamethyl Cyclotetrasiloxane
5. Phenol
6. 1,1'-Biphenyl
7. Diphenyl ether
8. Difluorobenzophenone
9. Fluorene
10. Diphenyl Methanone
11. Dichlorobenzophenone
12. Diphenyl Sulfone