

## Pyrolysis of a Multi-Layered Car Door Panel

### Application Note

Automotive Industry

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In the Automobile Industry, material suppliers often change their formulation like adding different additives, or changing the polymer, without notifying the manufacturer. And, even though passing specifications, it still could cause problems for the end user: the car driver. So, knowing as much as possible about the materials is important. An interior section of a multi-layered car door panel, was studied using pyrolysis. Components included a hard plastic backing, a foam interior, and a fuzzy (suede) feel fabric. Sample size was approximately 200 micrograms.

Both the plastic backing and the fabric top were run at one temperature, 700°C. The plastic backing had Bisphenol A and other substituted phenols, and Styrene, indicating it may be a mixture of polycarbonate and polystyrene, respectively (Figure 1). The suede-like fabric on the top exhibited pyrolysis products of polyethylene terephthalate (Figure 2).



Car door panel

The foam in the center was run at 3 temperatures; 150°C for volatiles, 300°C for semi-volatiles, and then 700°C (Figure 3). A small amount of didecyl phthalate plasticizer is seen at 150°C. At 300°C more phthalate plasticizers are seen(5,6,7), and the polymer starts to break down. Toluene diisocyanates (TDI, 3) indicate that the foam is a polyurethane made with TDI. Triethyl phosphate(1) is commonly added as a flame retardant. At 700°C, styrene and alpha methyl styrene are the major components (8,9). The foam is of polyurethane construction and the polystyrene noted could be from from the adhesive between the layers or was added with the polyurethane during the manufacturing process.

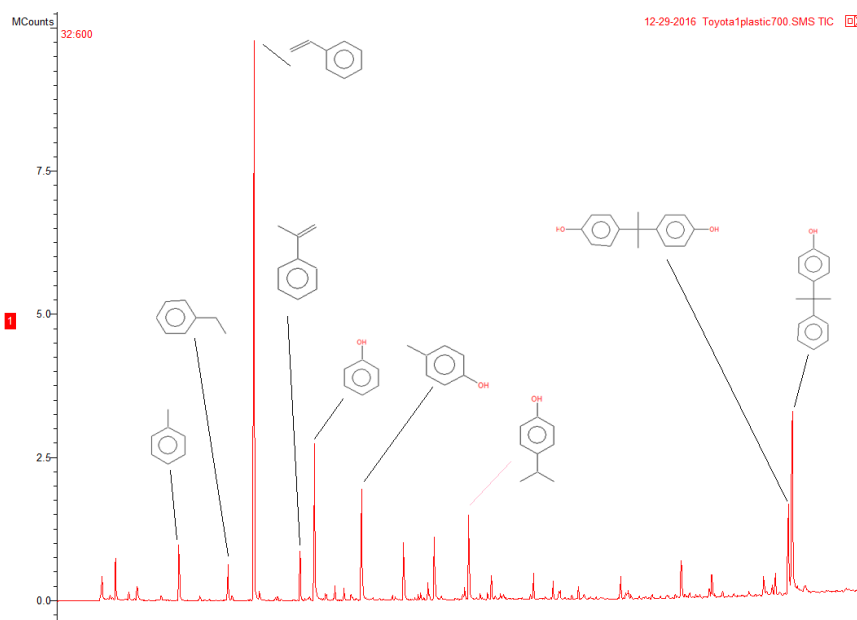


Figure 1: Plastic Backing of Door Panel, 700°C for 30 seconds.

### CDS Model 6200 Pyroprobe Conditions:

#### Interface:

Rest: 50°C  
 Final: 325°C for 3 minutes

#### Pyrolysis:

700°C for 60 seconds

#### Iso Zones:

Valve oven: 350°C  
 Transfer line: 350°C

### GC Conditions:

#### GC/MS

Column: 30m x .25µm 35% phenyl  
 Carrier: Helium, 1ml/min  
 Split: 50:1  
 Injector: 350°C  
 Oven: 40°C for 2 min  
 10°C/min to 310°C (hold 20 min)

Mass range: 30 to 600 amu

#### No Compound

- 1 triethyl phosphate
- 3 TDI
- 4 phthalic anhydride
- 5 phthalic acid,  
decyl- 2-ethyl hexyl ester
- 6 didecyl phthalate
- 7 phthalic acid,  
decyl dodecyl ester
- 8 styrene
- 9 a-methyl styrene

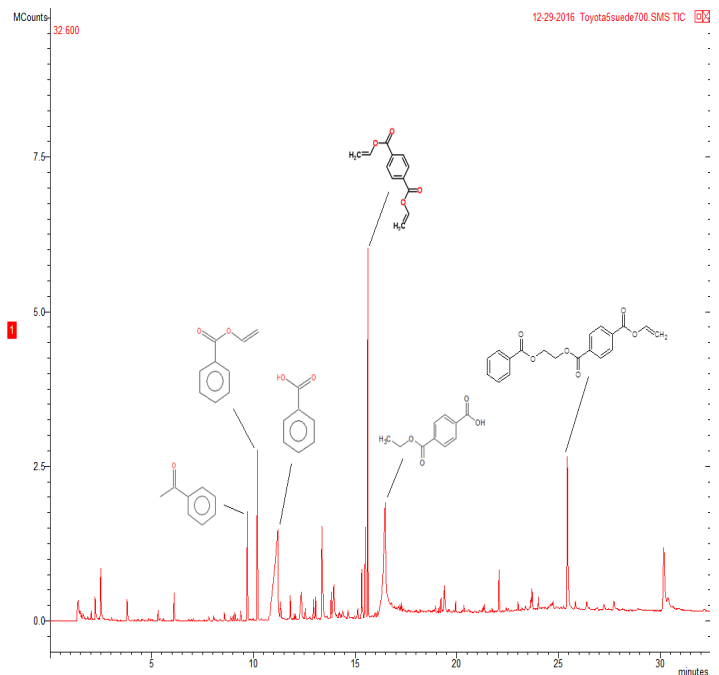


Figure 2: Fabric Top Layer of Car Door Panel, 700°C for 30 seconds.

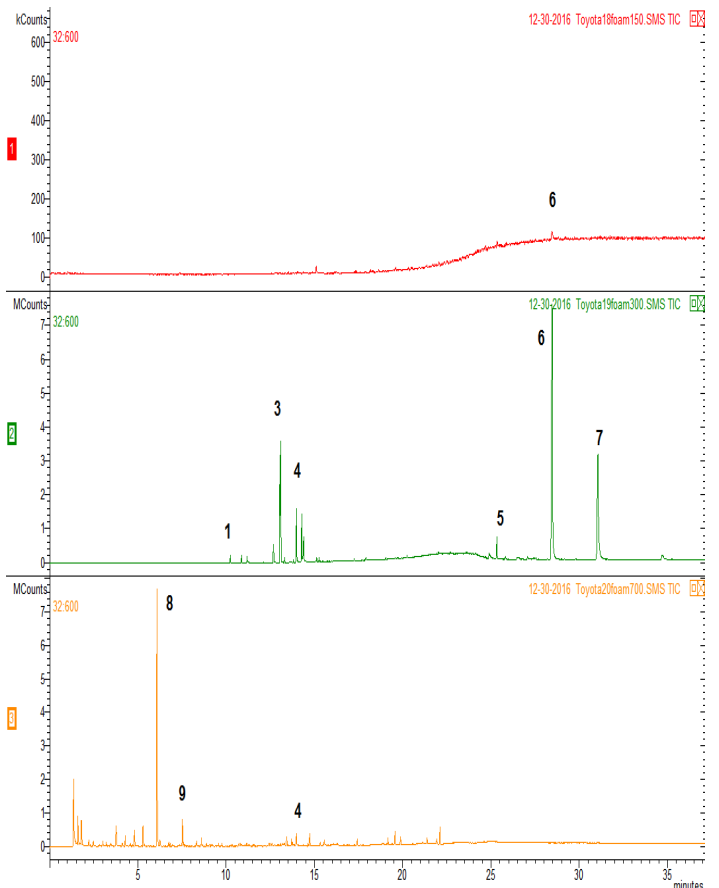


Figure 3: 3 Temperature of Inner Foam Layer: 150°C (top), 300°C (middle), and 700°C (bottom).