

## Pyrolysis-GC/MS of Pharmaceutical Packaging

### Application Note

#### Pharmaceutical Packaging

#### Abstract

Multi-step temperature sampling reveals components and differences between two blister packages.

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Medication blister packaging consists of layers of multiple materials. There is a backing, often paper and foil, hard clear plastic cover, and then glue which everything together. Performing multi-step pyrolysis on medication packaging can help an analyst uncover all these components, which may prove useful in failure analyses, and also competitive analyses.

Multi-step heating analysis was performed on packaging (about 100 mcg sample size) from allergy relief medication. At 150°C, very little evolved, but at 300°C, the packaging starts to degrade. Pyrolysis products of PVC (HCl, benzene and naphthalene), paper (furan and levoglucosan, and polyurethane (toluene diisocyanate) are revealed. At 700°C, the package continues pyrolysis, producing methyl methacrylate, and pyrolysis products of polyester, including benzoic acid.



Medication in Blister Packaging

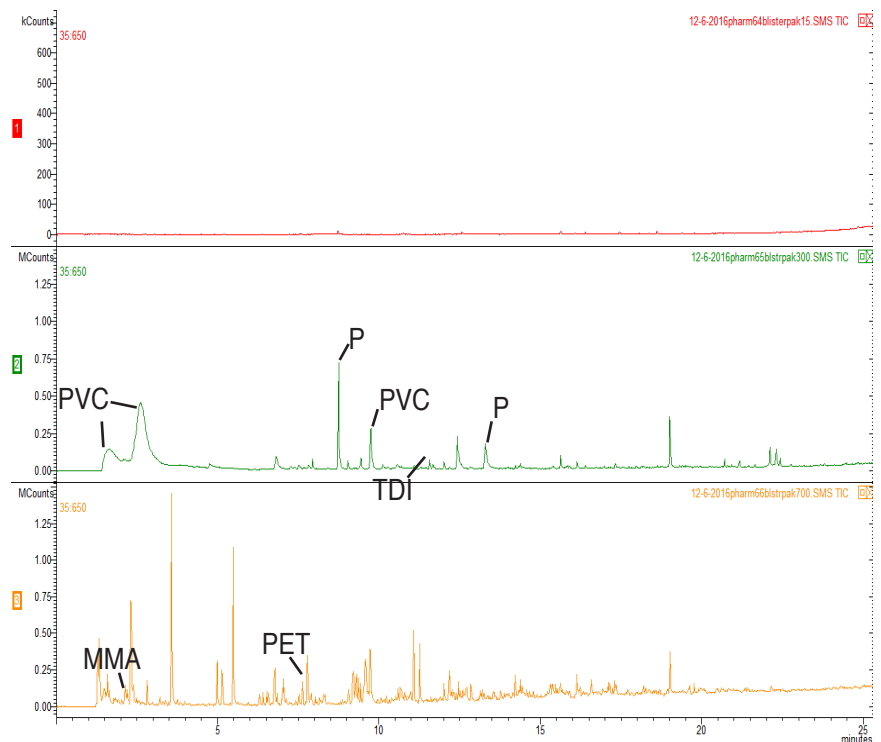


Figure 1. Blister Packaging Heated to 3 different temperatures, 150°C(top), 300°C(middle), 700°C(bottom). P=paper, TDI=polyurethane, PET=polyester, PVC= polyvinyl chloride, and MMA= polyacrylate pyrolysis products.

## Instrument Conditions

### Pyroprobe 6150

Pyrolysis: 150°C, 300°, and 700°C  
Valve Oven: 300°C  
Transfer Line: 325°C

### GC/MS

Column: 5% phenyl (30m x 0.25mm)  
Carrier: Helium, 100:1 split  
Injector: 350°C  
Oven: 40°C for 2 minutes  
10°C/min to 325°C  
10 minutes  
Mass Range: 35-550

The 300°C run of this blister packaging was compared to the 300°C run of different medication packaging (Figure 2). The chromatograms are similar; however, there are a few clear differences. These include ibuprofen, most likely a desorption product from the medication itself, and phthalic anhydride, often seen as a degradation product of polyesters made with phthalic anhydride.

Performing multi-step pyrolysis on finished products, like medication packaging can help an analyst find distinct differences in their chemical make-up, providing valuable information for competitive analysis and product development.

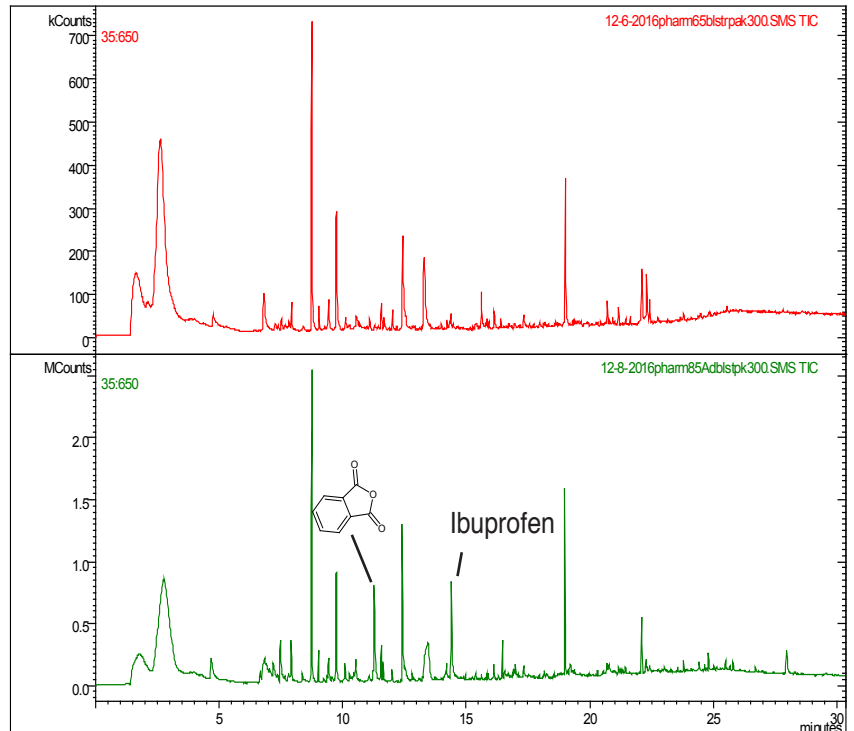


Figure 2. Two different medication packages at 300°C.