Pyrolysis-GC/MS Real and Faux Leather

Application Note
Textiles

Abstract
Pyrolysis reveals components and differences between different leather and faux leather products.

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Introduction
Pyrolysis-GC/MS allows for the analysis of organic materials which are too large to be compatible with GC alone. Material is heated in a controlled way, facilitating breakdown into volatile compounds which can be studied by GC/MS. Results are polymer specific, making pyrolysis the perfect way to analyze all types of polymers, including natural and synthetic textiles, such as leather and artificial leather.

About 100µg of sample was heated to a setpoint of 600°C.

Results and Discussion
Natural Leather
Collagen

True leather is made from animal skin, often cattle hide. The main constituent of animal skin is a protein called collagen. The building blocks of protein are amino acids, so the pyrolysis of collagen results in many ring structures such as pyrroles and indoles. Collagen is a high-sulfur protein, which explains the presence of methane thiol at the beginning of the pyrogram (Figure 1).

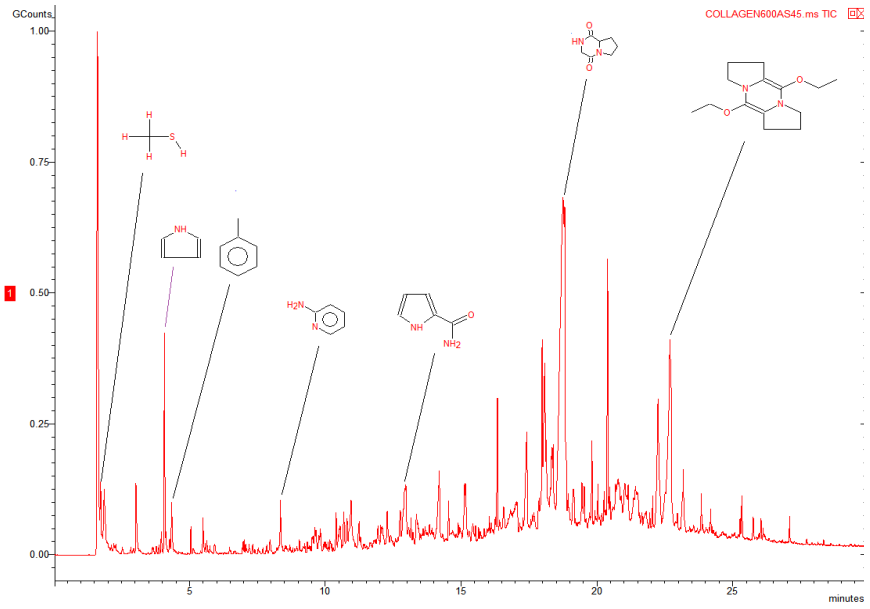

Figure 1. Collagen, 600°C.

Rawhide and Leather

As rawhide and leather are mostly collagen, their pyrograms are similar. Differences are from additives and contaminants. Both the samples of leather and a rawhide had peaks for plasticizers (Figure 2).

Instrument Conditions

6000 Series Pyroprobe Autosampler

About 100μg of sample was heated to a setpoint of 600°C.

Pyrolysis:	600°C 30 seconds
Valve Oven:	300°C
Transfer Line:	325°C

GC/MS

Column:	5% phenyl (30m x 0.25mm)
Carrier:	Helium, 75:1 split
Injector:	320°C
Oven:	40°C for 2 minutes 10°C/min to 300°C 10 minutes
Mass Range:	25-600

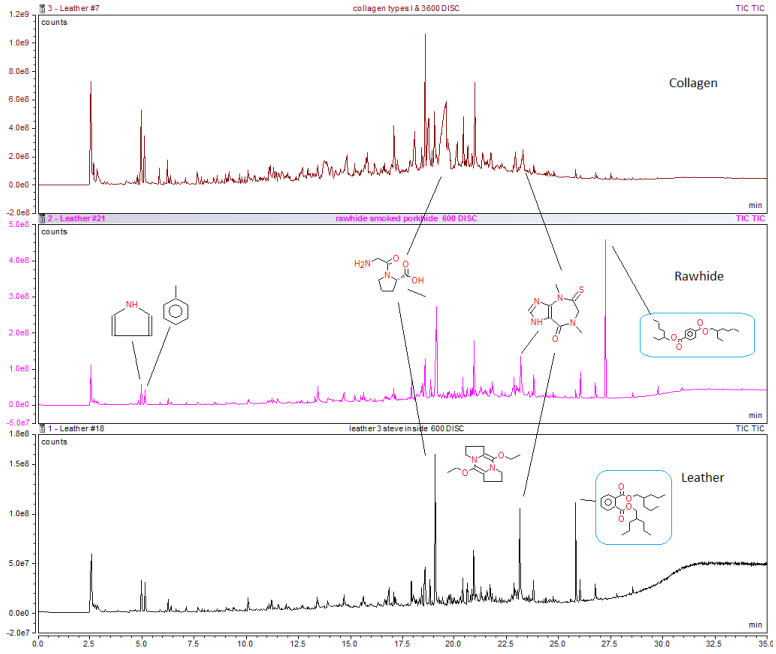

Figure 2. Collagen standard (top), Rawhide chew toy (middle), Leather Fabric (bottom). Rawhide has terephthalate plasticizer, leather has a phthalate plasticizer (plasticizers circled in blue).

Recycled and Faux Leather

Faux leather can look nearly identical to real leather but are far from the real thing. Also, leather can also come in a recycled form, but it is desirable to know how much of the material is pure leather.

While also containing pyrolysis products of leather,a portfolio advertised as recycled leather had large amounts of polyisoprene's monomer and dimer, which likely indicates it was made from scraps of leather, glued together with a polyisoprene adhesive (Figure 3).

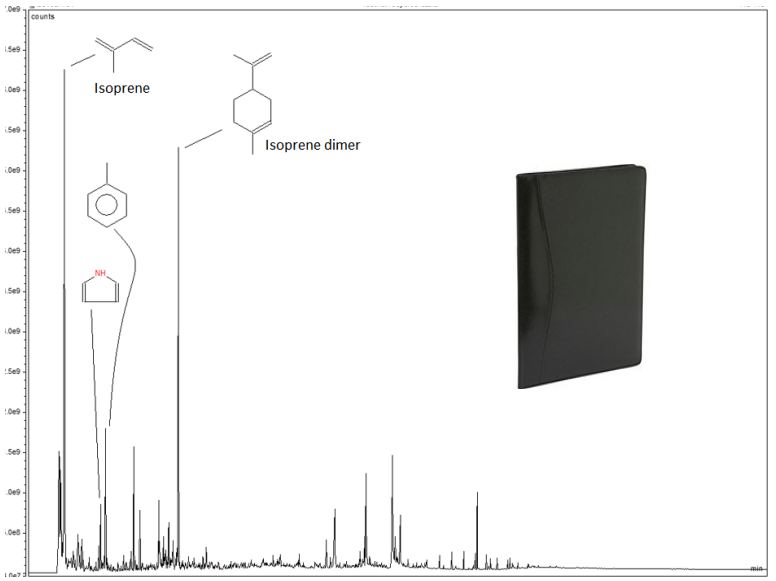

Figure 3. Recycled Leather Portfolio contains Isoprene monomer and dimer, indicating polyisoprene glue.

In Figure 4, two faux leather wallets which appear to differ only in color were analyzed. Pyrolysis reveals they are both acrylic and that the types of acrylics differ. The red wallet contains butyl methacrylate, and the orange wallet has butyl acrylate, but no butyl methacrylate. In addition, the orange wallet also has styrene.

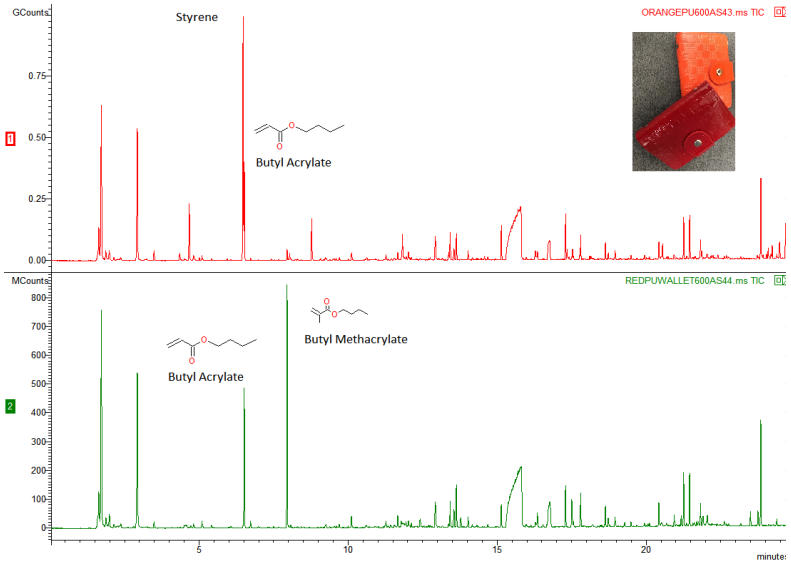

Figure 4. Orange Wallet (top), Red Wallet (bottom).

Conclusion

Pyrolysis GC/MS using the Pyroprobe 6000 Series Autosampler reveals detailed information about leather and faux leather products. Indeed, pyrograms of leather were close to rawhide and a collagen standard, but both leather and rawhide exhibit plasticizer additives. Contents of a recycled leather portfolio has pyrolysis products of leather, however, it contains mostly polyisoprene, and two colorful patent faux leather wallets are two different acrylics, one of these wallets also has styrene in its polymer matrix.