

Tri-Step Analysis of a Latex Glove

Application Note

Rubber

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Polymeric materials are almost always comprised of more than just a polymer. They may also contain additives like antioxidants, plasticizers, stabilizers, residual monomers and contaminants. Thermal sampling permits the analysis of both the volatile and non-volatile constituents of such a material directly to the GC/MS without the use of solvents. The sample is simply heated rapidly to successively higher temperatures, liberating different compounds for each GC run.

The latex glove used in this example contains a phthalate plasticizer, which is volatilized at the lowest temperature (200°C) shown in Figure 1. When the same piece of latex is then heated to 400°C for a few seconds, isoprene and limonene, the dimer of isoprene are released, confirming that the glove is made from natural rubber. In addition, at this temperature, a series of fatty acids and paraffins are detected, as seen in Figure 2. These are probably mold-release compounds on the surface of the glove from its manufacture.

The final analysis is a pyrolysis at 700°C. This pyrogram is typical for polyisoprene, and includes not only the monomer and dimer, but also higher oligomers as well. A single step analysis would have included the plasticizer, wax, fatty acids and residuals in the pyrogram, making the analysis more complex and perhaps obscuring some of the smaller constituents. This three-step thermal separation permits easy identification of the phthalate and other non-pyrolysis products, simplifying the total analysis.

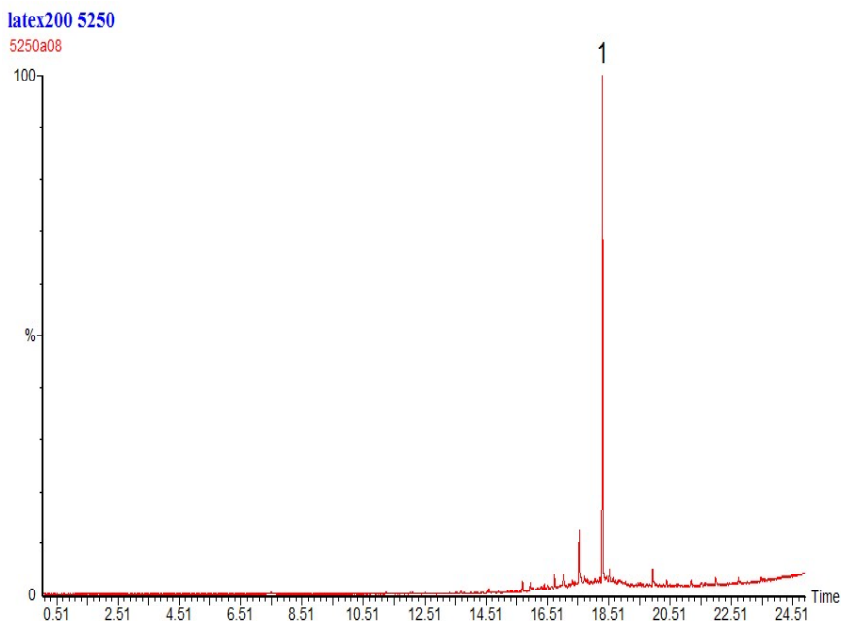


Figure 1. Latex glove at 200°C.

Instrument Conditions

Pyroprobe

Valve Oven: 300°C
Interface: 200°, 300°C
Pyrolysis: 400°, 700°C
Time: 15 seconds

GC/MS

Column: 5% phenyl (30m x 0.25mm x .25µm)
Carrier: Helium, 50:1 split
Injector: 300°C
Oven: 40°C for 2 minutes
10°C/min to 300°C

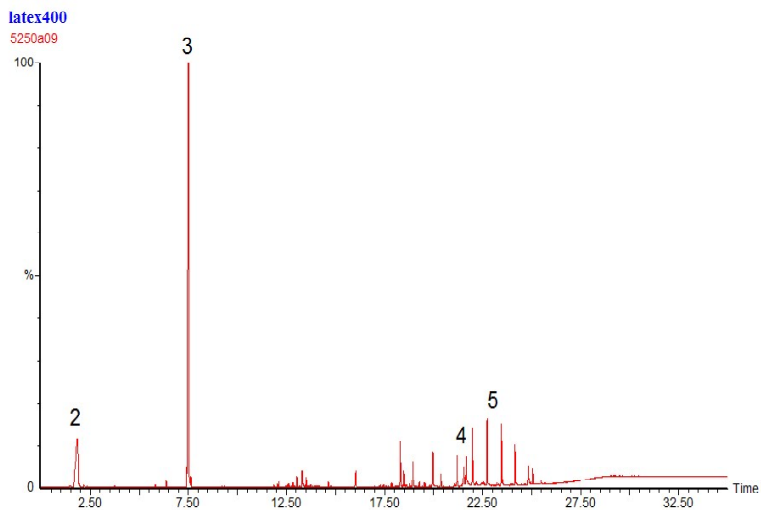


Figure 2. Latex glove at 400°C.

Table 1

| Peak # | COMPOUND |
|--------|-----------------|
| 1 | ETHYL PHTHALATE |
| 2 | ISOPRENE |
| 3 | L-LIMONENE |
| 4 | LINOLEIC ACID |
| 5 | WAX |
| 6 | TRIMERS |
| 7 | TETRAMERS |

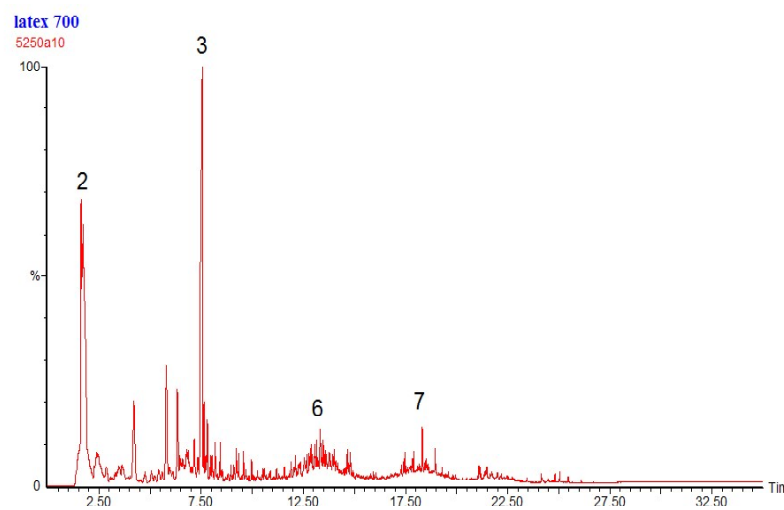


Figure 3. Latex glove at 700°C.

FOR MORE INFORMATION CONCERNING THIS APPLICATION,
WE RECOMMEND THE FOLLOWING READING:

T. P. Wampler, Temperature as a Sample Preparation Tool in the Analysis of Materials by GC/MS, LC-GC, 17: 9 (1999).