Pyrolysis of Soy Clothing Fiber

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Application Note

Today, you can buy clothing made from agricultural sources other than cotton; there's bamboo, corn, hemp and even soy. However, if you are think that soy fiber is made from 100% soy, or even is just 100% natural, this may be untrue. Pyrolysis GC/MS can be used to help determine fabric content, including the discovery of mislabeled consumer goods. It is a way of introducing nonvolatile materials to a gas chromatograph by using thermal energy to break molecular bonds, as a result, fragmenting solid material into volatile components which can be separated by the gas chromatograph.

We performed pyrolysis of tofu and texturized soy protein from the grocery store, and a fresh soybean to compare with soy fiber. Their pyrograms (not shown here) are almost identical. Figure 1 is a pyrogram of texturized soy protein. Soy clothing fiber, however, looks very different. It has only very few similarities to soy protein, such as aromatics and phenols. However, aromatics and phenols would not indicate specifically soy protein; they are pyrolysis products of many polymers.

Because soy fiber looked so different from soy protein, we performed more research on how soy fiber is made, and discovered that it is made from soy fiber and polyvinyl alcohol. We pyrolyzed different grades of polyvinyl alcohol and discovered that soy fiber more closely resembles partially hydrolyzed (low grade) polyvinyl alcohol, (Figure 2), and we found very few pyrolysis products that are related to soy.
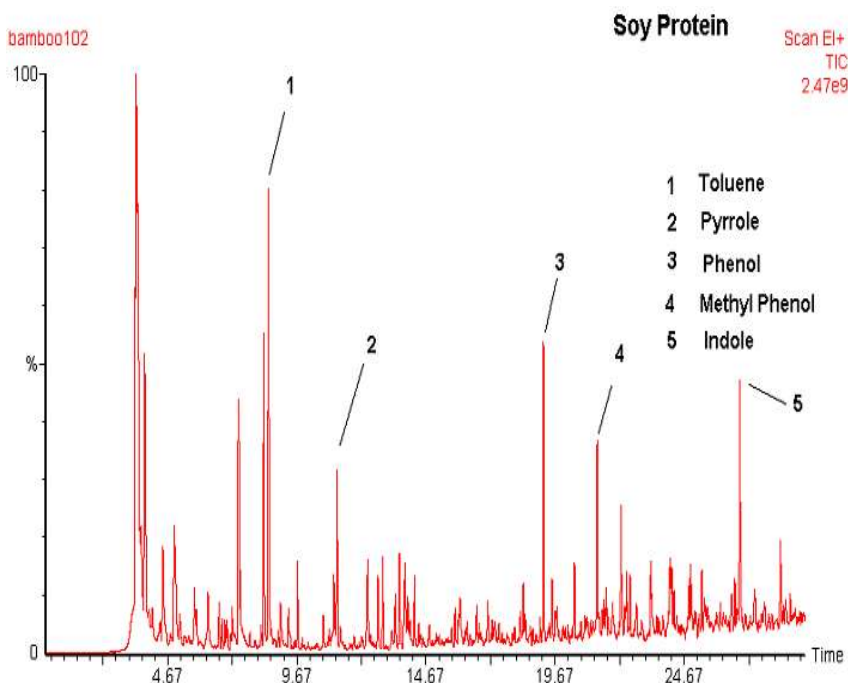

Figure 1. Pyrogram of texturized vegetable (soy) protein.

CDS Pyroprobe

Interface:
  Rest: 50°C
  Final: 325°C for 3 minutes
Pyrolysis:
        600°C for 30 seconds
Iso Zones:
Valve oven: 350° C
Transfer line: 310° C

GC/MS

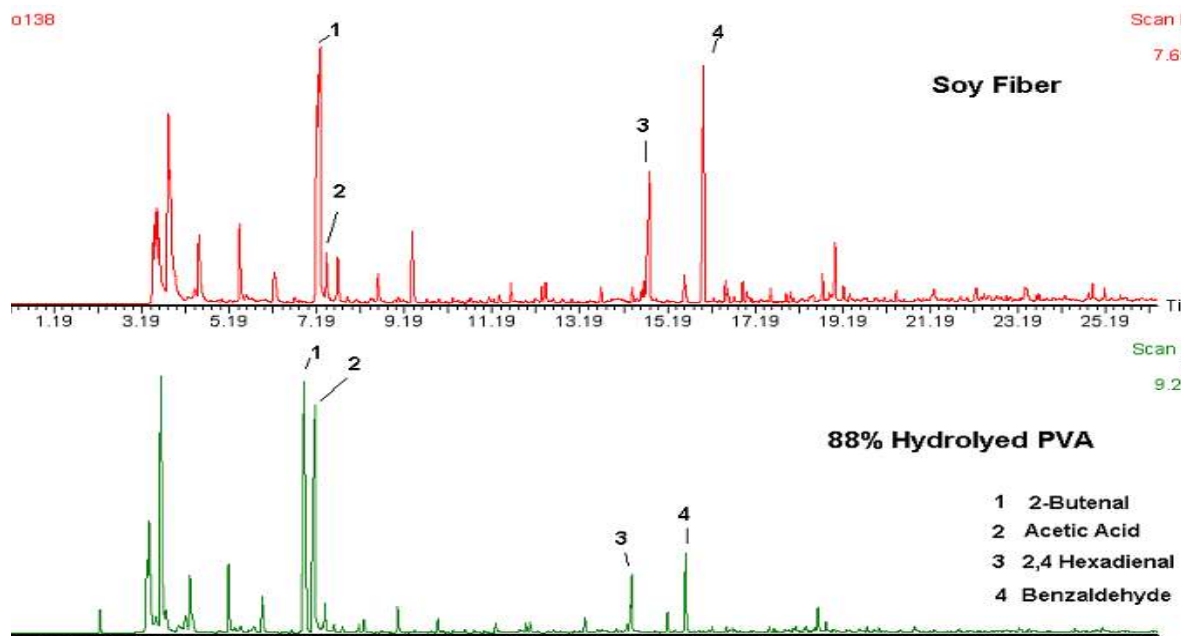|	
Column:	1701 60M 0.25mmID 0.25μm df
Carrier:	Helium, 50:1 split
Injector:	350°C
Program:	40°C for 2 min
	6°min to 280°C(15min)
Mass range:	25 to 620 amu

Figure 2. Soy clothing fiber (top),and low grade polyvinyl alcohol (bottom).