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APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

The Use of Pyrolysis GC-MS to Characterize Artificial Sweeteners

Low calorie sweeteners are becoming more important as more consumers become concerned about obesity and dental cavities. Sweeteners are typically analyzed via HPLC, but thermal desorption and pyrolysis opens the gas chromatograph's arena to include heavier, nonvolatile species. In this application note, we use pyrolysis GC/MS to investigate two artificial sweeteners sucralose, and aspartame. We heat these sweeteners to different temperatures, and study their decomposition products. We then identify sweetener components in beverages.

Sucralose has a similar structure to sucrose: three of the hydroxy groups on sucrose are replaced with chlorines. As a result, sucralose pyrolyzes quite differently. A peak for HCl can be seen at the beginning of its chromatogram (not shown), indicating that chlorine cleaves from the main structure. While sucrose produces levoglucosan, sucralose does not. Instead, it has a large peak at 16.83 minutes, its identification is unclear to us (Fig 1). A zero calorie sports drink sweetened with sucralose was concentrated 10x and analyzed. It also had a peak for m/z 89 at 16.83 minutes which could be from sucralose (Fig 2).

Aspartame is a methyl ester of an amino acid. Known to be unstable when heat is applied, it had two major decomposition products when heated to 300°C. Both peaks identify as n-formyl phenyl alanine, methyl ester, which is a fragment of aspartame. When diet soda is concentrated and analyzed, m/z 162 and 261 can be extracted to show those peaks. One is buried under a large peak for caffeine (Fig 3).

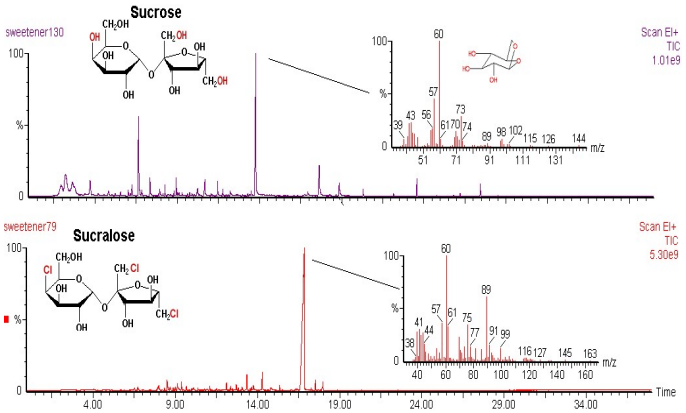

Figure 1. Sucrose and sucralose pyrograms.

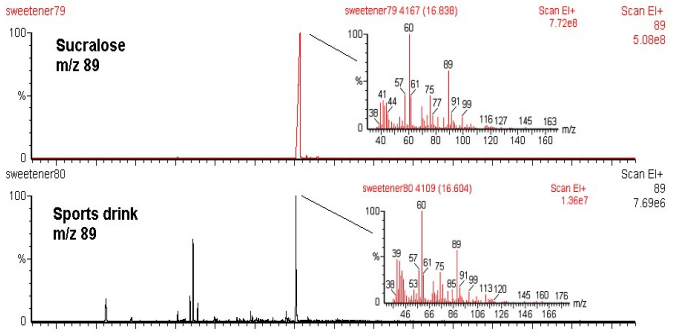

Figure 2. Sucralose in diet soda.

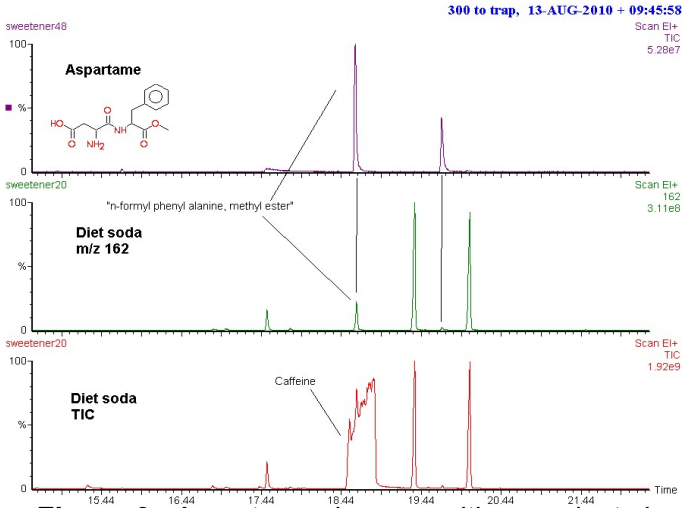

Figure 3. Aspartame decomposition products in diet soda.

Equipment
CDS Model 5200 Pyroprobe interfaced to a Gas Chromatograph/Mass Spectrometer.

Model 5200 Conditions
Valve Oven: 325°C
Transfer Line: 325°C
Temperature: 750° or 300°C
Time: 15 seconds

Interface Final: 325°C for 3 minutes

Trap Material: Tenax TA
Trap Rest: 50°C
Trap Final: 300°C for 3 minutes

GC Conditions
Carrier: Helium
Injector: 325°C
Split: 50:1
Column: HP-5MS (aspartame) and RTX-35MS (sucralose) (30m X 0.25mm)
Detector: Quadrupole MSD
Range: 35 - 550amu

GC Program:
Initial: 40°C for 2 minutes
Ramp: 10°C/min.
Final: 300°C for 10 minutes

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

A. Rahn, V.A. Yaylayan, Food Chemistry 118(2010) 56-61.
G.C. Galletti et al., J. Anal. Appl. Pyrolysis 32(1995) 137-151.
W. Qui, et al., Chromatographia 66(2007) 935-939.

Additional literature on this and related applications may be obtained by contacting your local CDS Analytical representative, or directly from CDS at the address below.

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