Hiden Analytical MS Systems for TG-MS

Combining a Thermogravimetric Analyzer (TGA) with a Mass Spectrometer (MS) allows you to detect very low levels of impurities. By heating a sample on the TGA, it will release volatile materials or combustion components as it burns. These gases are then transferred to the MS for identification. The sensitivity of TG-MS is a powerful tool for quality control, safety, and product development.

When working with a hyphenated instrument, it is important to understand how each instrument works and how the connection affects them both. PerkinElmer manufactures a wide range of products, from thermal to gas chromatography and from infrared and Raman spectroscopy to Inductively Coupled Plasma (ICP).

Hiden Analytical™ MS Systems:

Hiden Analytical has a reputation for making state-of-the-art mass spectrometers and SIMS. Our collaboration allows us to offer you a range of hyphenated solutions that can address your diverse laboratory needs.

- 200, 300, and 500 amu systems available
- Mass range is upgradeable post sales
- Operation in Helium
- Variable or Soft ionization to control fragmentation
- Easy to connect transfer line
- In-line filters with wide capillary end
- User friendly software
- Automatic triggering of the MS run at the start of the TGA run

Hiden Analytical systems can be coupled to a range of PerkinElmer products allowing you to configure a system with the type of TGA and MS unit needed to address their particular applications and budget needs. PerkinElmer's TGA systems which can be used with Hiden Analytical Systems are:

- TGA4000 – our rugged, low cost TGA solution
- STA 6000 – DTA and TGA results simultaneously to 1000 °C
- STA8000 - DTA and TGA results to 1600 °C

In pharmaceutical manufacture, small amounts of recrystallization solvents need to be removed before processing the powder. TG-MS allows the detection of low levels of residual solvents as shown below.

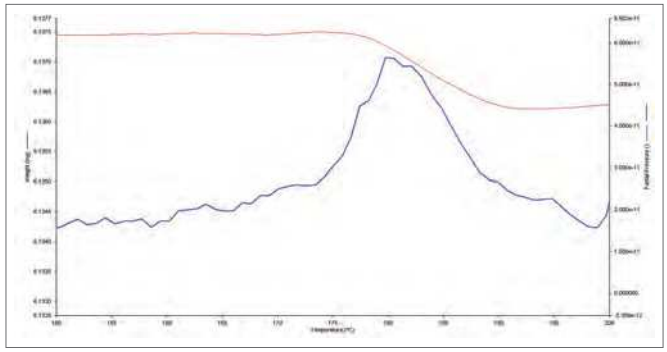

Figure 1. The combined TG-MS is ideal for detecting small traces of residual solvents in pharmaceuticals as shown in the detection of low levels of methylene chloride, above.

As you can see, the weight loss in the TGA is very small. Despite that, a clear identification of the material is obtained from the MS. In another case, a blend of solvents coming off in the same temperature range is identified. Shown below, the single weight loss in the TGA is seen to consist of water, ethanol, and acetone.

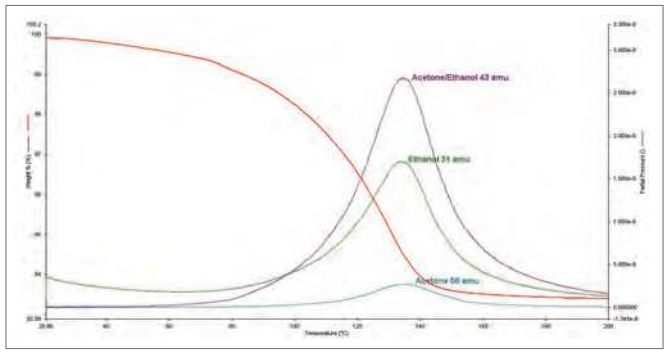

Figure 2. The combination of TGA and MS allows one to quantify the weight loss from a material and identify the components being evolved.

TG-MS

PerkinElmer's extensive product range means we can supply you with a complete system with one party service and support as well as the expertise and knowledge to help you use it effectively.

The PerkinElmer TL8500 transfer line allows you to couple our full range of Thermogravimetric Analyzers (TGA) and Simultaneous Thermal Analyzers (STA) to a PerkinElmer Clarus SQ 8 GC/MS.

The TG-MS system uses:

- Our range of TGA and STA Systems, to optimize sensitivity to weight loss
- The TL8500 is equipped with a 350 °C transfer line, mass flow control, and pumps. The TL8500 allows connection to other brands of MS
- The Clarus SQ 8, for accurate identification

By using the PerkinElmer Clarus® SQ 8 Mass Spectrometer, the same MS used in PerkinElmer's state of the art GC/MS systems, one gains the advantages of:

- Operation in Helium
- The detection of mass ions up to 1200 daltons
- Soft ionization (adjustable EI) to limit fragmentation of the mass ion
- The ability to add chemical ionization (CI) to decrease fragmentation
- Automatic triggering of the MS run at the start of the TGA run

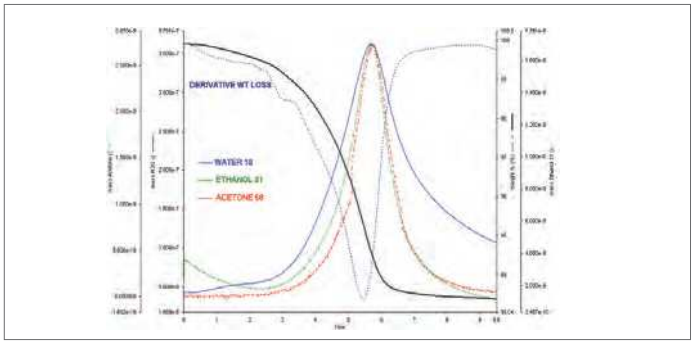

Figure 1. The combination of TGA and MS allow one to quantify the weight loss from a material and identify the components being evolved.

One of the advantages of TG-MS is it is real time and very sensitive. This has several applications in detecting residual solvents in pharmaceuticals and in measuring additives in polymers. In Figure 1, we see an example of a TGA curve, overlaid with the mass ion peaks for three common solvents.

Another example is the decomposition of rubber in the TGA while the evolved gases are tracked as a function of time (Figure 2).

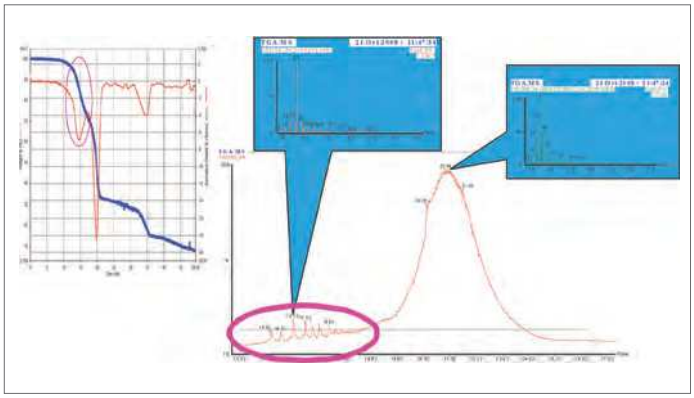

Figure 2. When burning a complex material like rubber, the TGA data is often confusing. MS on the evolved gas allows us to determine what comes off in the initial weight loss.