

### Summary

This application note describes the method to determine the amount of net ash for a range of plastics using ISO 3451-1 and ASTM F648 -10a.

### Background

An ash test is used to determine inorganic residues in materials. Inorganic residues found in plastics may be in the form of antiblock agents, fillers, reinforcements, catalyst residues, and pigments. An ash test is used only to quantify the total inorganic residual in the plastics and cannot be used to identify the individual chemical components of the ash without additional test procedures being performed, such as FTIR analysis or TGA. When FTIR is combined with TGA, the individual components of the ash residual can be identified.

### Procedure

The calcination method is used to determine the ash residual in two forms of plastics; powder and fabricated parts. The direct calcination method involves taking a known amount of sample into a pre-conditioned and pre-weighed porcelain crucible, burning the organic matter in an air atmosphere at temperatures around 600°C (pre-burn), heating the remaining residue at 800°C, and weighing the crucible after it has been cooled to room temperature in a desiccator. The procedure is repeated until a constant mass is reached .

The ash test result is expressed as % ash, calculated from the mass of the ash ( $m_{ash}$ ) and the initial mass of the sample ( $m_{sample}$ ). The net ash can also be reported in parts per million (ppm) or equivalently mg/kg.

$$\% \text{ net ash} = \frac{m_{ash}}{m_{sample}} \times 100$$

In one test, ultra high molecular weight polyethylene (GUR 1050 UHMWPE) in both powder and consolidated form was ashed per ISO 3451-1. The net ash for the powder and the consolidated resin was 49.9 ppm and 57.7 ppm, respectively.



**Figure 1: Crucible undergoing pre-burn with a propane torch to burn off the bulk of the sample (left), followed by incineration in the muffle furnace at 800°C for the complete ashing.**