



## HOW TO GUIDELINES

### Preparation of Domestic Waste for Elemental Analysis

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Domestic waste presents a very inhomogeneous mix made up of very different substances. Apart from polymer synthetics and organic substances like cork, wood, and paper there may be inorganic materials and metals present. In order to use this domestic waste in a useful way it is burned in waste incinerating plants to gain heat combustion.

### Non-Uniform Composition

As well as the elemental analysis the G.H.V. and N.H.V. (gross and net heat value) is of interest. To this end the waste has to be ground and homogenized as well as possible. The variable composition does not allow the use of a traditional ball mills or swing mills. Cutting mills could possibly grind these samples but not to the particle size necessary for organic elemental analysis.

### Brittleness Through Cooling

The Freezer/Mill (a cryogenic mill) is effective where these grinding processes fail. Flexible materials like plastics and biological samples embrittle at liquid nitrogen temperatures. The sample is hermetically sealed in the grinding vial and immersed in liquid nitrogen, so cross contamination is eliminated. As the Freezer/Mill is driven magnetically there is no wear and tear on moving parts. For the best possible grinding results the sample has to be cooled to the optimum. To this end the roughly pre-ground sample can be pre-cooled in the grinding vial or poured into it already cooled. After 20 minutes of pre-cooling the sample was ground for three minutes, followed by one minute of 'inter-cooling' to ensure good brittleness and then ground further. This cycle was repeated three times.

### Results

Cryogenic grinding with the Freezer/Mill showed good results with the homogenization of domestic waste. The obtained powders displayed good particle size and homogeneity, suitable for elemental analysis. Following the results of organic elemental analysis the G.H.V. and N.H.V. of the waste sample can be calculated and thus ascertained if and how much fuel has to be added for optimum combustion in the incinerating plants. With sulfur analysis information regarding a possible environmental impact can be gained. Finally, ash analysis after incineration of domestic waste samples gives information about the remaining residues that have to be disposed of.

∴ APPLICATION NOTE SP002:  
Grinding/ Homogenization

∴ APPARATUS:  
**Freezer/Mill®**

∴ APPLICATION:  
Domestic Waste



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