



## **Elemental Analysis Methods**

All of our Elemental Analysis methods are based on mass. Samples are weighed on calibrated micro-balances and certified standards are used to calibrate the instruments and standardize methods.

### **% CHN and %S**

#### **CHN and S Elemental Analyzers**

The sample is combusted in a pure oxygen environment; the gases are carried through the system by helium, converted and measured as CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub> and SO<sub>2</sub>. The product gases are separated under steady-state conditions and are detected by Thermal Conductivity or IR. The C, H and N methodologies based on the Pregl (CH) and Dumas (N). (CHN: [ASTM D5291](#)).

Precision: +/- 0.30 %      LOD: < 0.10%

### **% Oxygen**

#### **Organic Oxygen by Pyrolysis**

Material is pyrolyzed, acid gases are filtered and detection is made by IR with an automated analyzer or by gravimetric determination (Unterzaucher method). These methods are for organic materials only: [ASTM D5622](#). Elements that may interfere with oxygen analysis: high fluorine >30%, metals

Precision: +/- 0.30 %      LOD: < 0.10%

### **% Sulfur and Halogens % Br, Cl, F and I**

#### **Ion Chromatography**

Samples are put into solution by Oxygen Flask Combustion converting the halogen to its ionic form (bromide, chloride, etc.). The solution is diluted, filtered and injected into the instrument; data is collected and then calculated.

Precision: +/- 0.30%                      LOD: < 0.10% (Iodine LOD <0.25%)

### **Nitrogen Kjeldahl (micro)**

This method is applicable to all compounds where nitrogen is linked to carbon or hydrogen. Compounds containing nitrogen linked to nitrogen or to oxygen or sulfur cannot be determined by this method. The sample is digested in sulfuric acid containing potassium sulfate and catalyst. The digest is distilled into caustic and the ammonia is titrated against standard acid.

Precision and LOD vary based on N concentration and sample weight.

Precision: +/- 0.020%      LOD: < 0.020%

### **Inorganic Analysis**

#### **ICP**

Inductively Coupled Plasma is an emission spectrophotometric technique. An aqueous sample solution is pumped and atomized with argon gas into hot plasma. The sample is excited, emitting light wavelengths characteristic of its elements. A mirror reflects the light through the spectrometer on a grating that separates the element wavelengths onto photomultiplier detectors.

Preparation: Aqueous solutions may only require dilution before introduction into the instrument. Non-aqueous solutions and solid materials require acid or bomb digestion.

RSD: 25%                      LOD: < 1 PPM

*Alternative techniques similar to the listed methods may be employed.*