

ETV-ICP-OES THE MOST ACCURATE DETECTION LIMITS

FOR HIGH PURITY CARBON
AND GRAPHITE



ETV-ICP OES

Electro Thermal Vaporization & Inductively Coupled Plasma Optical Emission Spectrometry



The high-tech applications of graphite (semiconductors, photovoltaics, nuclear...) often require strict control over impurities in the material. After setting the standard for supplying the highest purity graphite in the industry, Mersen now offers the most sophisticated method for measuring graphite purity. The ETV-ICP analytical method has been applied to develop a powerful, rapid and reliable tool for analysing impurity content of solid samples with very low limits of detection. ETV-ICP has proven to be the reference for analysing graphite and can be considered as state-of-the-art technique.

How does it work?



Sampling, loading and heating

The graphite sample (solid or powder) is loaded into a high temperature graphite furnace. The sample is heated up to 2800°C.

Electro Thermal Vaporization

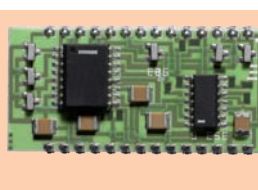
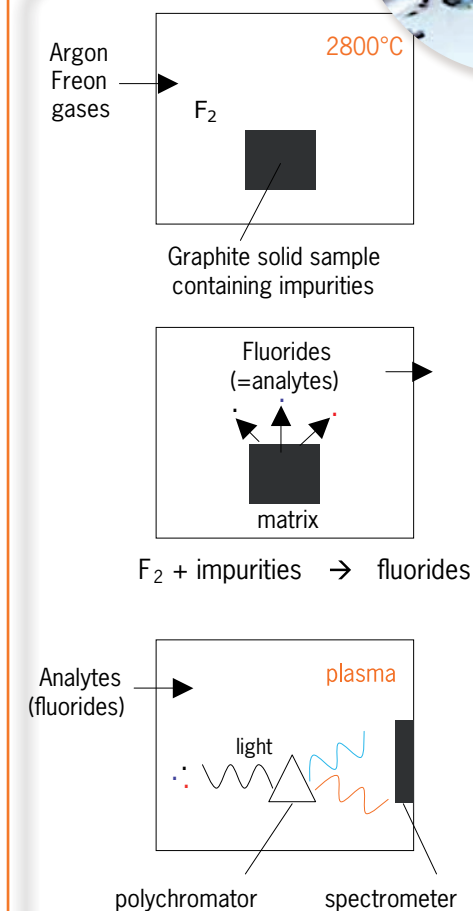
Freon gas and Argon carrier gas circulate in the furnace. The precursor gas decomposes into Fluor (F_2), that reacts with impurities contained in graphite to form fluorides (analytes), and extracts them from the graphite matrix.

Inductively Coupled Plasma

The gas carrying analytes (fluorides with impurities) is introduced into a plasma chamber. Molecules are excited under plasma and emit light with different wavelengths characteristic of each atom of impurity.

Optical Emission Spectrometry

Light is then decomposed by wavelength through a polychromator (prism-like) and analysed by a spectrometer. Light intensity at a given wavelength is directly proportional to the concentration of an atom in the plasma. Thus exact content proportion of each atom can be calculated.



Advantages of the ETV-ICP analytical method

- Contamination-free introduction of samples without sample decomposition or dilution. Solid as well as liquid sampling is possible.
- Sampling and calibration of graphite possible with existing standards and reference solutions, which is not the case with the GDMS method (Glow Discharge Mass Spectrometry).
- Very effective thanks to high transport efficiency of gases used. No spectral interference from the matrix.
- Simple and rapid acquisition: up to 50 samples analysed per day with automatic loading. Suitable for routine analysis.
- Very low limits of detection for most elements of the periodic classification, 1 - 50 µg/kg = ppb (parts per billion).
- Perfectly adapted to purified graphite, carbon/carbon composite and carbon insulation materials.
- Value-added service for customers.

ETV-ICP-OES, Limits of detection

Detection Limits ug/Kg = ppb (Parts per Billion)

H Hydrogen																	He Helium				
Li Lithium 5	Be Beryllium 1															B Boron 5	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon
Na Sodium 10	Mg Magnesium 0.1															Al Aluminium 10	Si Silicon 50	P Phosphorus 20	S Sulfur 30	Cl Chlorine	Ar Argon
K Potassium 10	Ca Calcium 1	Sc Scandium 1	Ti Titanium 2	V Vanadium 2	Cr Chromium 5	Mn Manganese 1	Fe Iron 2	Co Cobalt 2	Ni Nickel 5	Cu Copper 2	Zn Zinc 1	Ga Gallium 5	Ge Germanium 50	As Arsenic 20	Se Selenium 20	Br Bromine	Kr Krypton				
Rb Rubidium	Sr Strontium 1	Y Yttrium 1	Zr Zirconium 1	Nb Niobium 5	Mo Molybdenum 10	Tc Technetium	Ru Ruthenium 20	Rh Rhodium 5	Pd Palladium	Ag Silver 10	Cd Cadmium 5	In Indium 30	Sn Tin 10	Sb Antimony 50	Te Tellurium 20	I Iodine	Xe Xenon				
Cs Cesium	Ba Barium 1	La Lanthanum 1	Hf Hafnium 1	Ta Tantalum 10	W Tungsten 10	Re Rhenium 5	Os Osmium	Ir Iridium	Pt Platinum	Au Gold 50	Hg Mercury 100	Tl Thallium 30	Pb Lead 10	Bi Bismuth 5	Po Polonium	At Astatine	Rn Radon				
Fr Francium	Ra Radium	Ac Actinium	Rf Rutherfordium	Db Dubium																	
					Ce Cerium 5	Pr Praseodymium 10	Nd Neodymium 5	Pm Promethium	Sm Samarium 5	Eu Europium 5	Gd Gadolinium 5	Tb Terbium	Dy Dysprosium 5	Ho Holmium	Er Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium			
					Th Thorium 5	Pa Protactinium	U Uranium 10	Np Neptunium	Pu Plutonium	Am Americium	Cm Curium	Bk Berkelium	Cf Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Nobelium	Lr Lawrencium			

White numbers define - Units selected Elements for Polychrometer (35). All Blue & Green Elements detectable using Monochrometer (selectable)

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needs to enable them to optimize their manufacturing process in sectors such as energy, transportation, electronics, chemical, pharmaceutical and process industries.

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