

Analytical Quality with Genuine PerkinElmer Graphite Parts

Atomic Absorption



Today's analysts expect analytical performance from their graphite furnace atomic absorption (AA) instruments which is reproducible from day to day with respect to sensitivity (characteristic mass), precision, and time-temperature programs used for a certain application. In light of international ISO or GLP regulations, parameters such as characteristic mass become more and more important for validating the performance of the graphite furnace system. The graphite tube, the central part of the graphite furnace, plays a vital role in the overall stability of the system. In order to ensure stable analytical conditions from one atomization cycle to the next and from graphite tube to graphite tube, all graphite parts (contacts, tubes and platforms) require strict quality control.

Important parameters for the analytical performance of graphite tubes are:

- **Mechanical dimensions of the tubes within very narrow tolerances:** Small changes in dimensions such as thickness of the wall and thickness of coatings often have a pronounced influence on the mean temperature of the tube, on the local temperature distribution inside the tube and on the heating rate of tube and platform during the atomization step.
- **Selected and carefully controlled graphite materials:** The composition and the micro structure of the base graphite material determines the specific resistivity of the tube. The furnace power circuitry is designed to provide accurate temperature control only with tubes having a narrow range of specific resistivity. Small changes in the composition of the tube material will alter the temperature characteristics of the graphite tube and hence, the analytical performance for the elements to be determined.
- **Quality of the pyrolytic coating:** The thickness of the layer of pyrolytic coating has an influence on the total resistance of the graphite tube and on the temperature distribution within the tube. The microstructure and density of the surface is probably the most important parameter for the atomization kinetics of analyte elements. Irreproducible surface qualities will cause changes in the optimal drying, pyrolysis and atomization temperatures, peak shape, and characteristic mass. Improper pyrolytic coating can also shorten tube lifetime dramatically.

Authorized Tubes and Imitations

From the points discussed above, it becomes obvious that the production of high-quality graphite components requires stringent quality control. To ensure high quality and consistency, a specific high-density base graphite material has been developed for use with PerkinElmer graphite furnace systems. This base graphite material is used *exclusively* for the manufacture of PerkinElmer graphite tubes and platforms. During manufacture, a comprehensive quality testing program including extensive mechanical, electrical, thermal and analytical testing procedures is strictly followed. Each manufacturing lot of graphite tubes is tested to demanding tube life, sensitivity and precision specifications. This extensive testing ensures that all graphite components shipped by PerkinElmer provide consistent lot-to-lot performance.

Other features of PerkinElmer graphite tubes include the addition of a mark on the tubes in the form of a dot. This marking indicates the orientation of the platform and guides the user on the proper installation into the graphite furnace. Consistent installation of graphite tubes facilitates accurate and precise analytical results.

Graphite components offered by other companies are available for use in PerkinElmer graphite furnace systems. In some instances, the same PerkinElmer part number is used, implying that these components are made from the same material and provide equivalent performance. This is misleading, as these imitation components are *not* made from the same base graphite material, nor are they tested to the same demanding quality control specifications. The different base graphite material will alter the temperature calibration, the heating rates and the performance characteristics. PerkinElmer has over five decades of experience in the design/development of graphite furnace systems and materials. The proper performance, maintenance and serviceability of our graphite furnace systems can be assured only through the use of genuine PerkinElmer supplied graphite components.

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