10.3.4.7 Laser atomization and excitation for use in atomic emission spectroscopy

Lasers of high power output, e.g., Q-switched lasers, may be capable of producing atomic vapour at such high temperatures that appreciable atomic radiation is generated, thus acting as a one-step excitation source for AES.

10.3.4.7.1 Laser atomization with additional excitation

The laser-produced plume can additionally be excited by a supplementary source. In this two-step procedure, the radiance of the analysis lines can be increased and the line-to-background intensity ratios can be improved.

If the laser plume is allowed to enter a spark gap across which a medium voltage spark discharge takes place, additional atomization and excitation are possible. This is called spark cross-excitation. The spectra produced in this way are essentially those of a medium voltage spark. Triggering of the auxiliary discharge may be effected by the laser plume itself or by external means.

10.3.4.7.2 Analytical applications

The possibility of vaporizing material from a pre-determined small area of a sample makes laser atomization suitable for laser local analysis. Microanalysis is possible if a microsample can first be concentrated into a small volume and positioned on to a suitable support in such a way that a local analysis can be carried out. Additional excitation is also necessary. Homogeneous samples of almost any kind can be analyzed by laser atomization using high power single laser-shot operation or alternatively, scanning a part of the sample area by using a number of laser shots, of lower energy and power, may form the basis of scanning laser analysis.