

10.3 Processes and techniques

10.3.1 Radiation sources

Radiation sources are defined as those devices and their associated apparatus components which produce *electromagnetic radiation* for various purposes. The term radiation source is preferred to light source, as the word light is understood to refer to the spectral region to which the human eye is sensitive.

The classification of radiation sources may be based on two general physical forms of radiation, viz, *coherent* and *non-coherent electromagnetic radiation*.

Coherent sources include those sources where the radiation has a constant phase relationship between wave fronts, spatially as well as temporally, e.g., *lasers*.

Non-coherent optical sources emit radiation which is randomly distributed in phase, spatially as well as temporally.

A broad classification of non-coherent optical sources may be made as follows: *gaseous discharges*, which include most known light sources; *chemical flames*, which are gases heated by *exothermic reactions* between two or more gases; *incandescent bodies*, which give rise to *non-discrete continuous radiation* and other miscellaneous sources, such as phosphorescent bodies, X-ray sources, etc. The sources discussed in this part are tabulated in Table 10.5. Terms and symbols for general quantities and units are included in Table 10.6.

Most radiation sources perform several of the tasks of *volatilization*, *atomization*, *ionization* and *excitation*.

The pressure within a *plasma* (see Section 10.3.1.1.1.) affects the characteristics of the radiation significantly. Sources may therefore be classified into various groups depending on the average gas pressure at which they operate. They can also be classified according to the type of radiation e.g., continuous, molecular), but for the purpose of this document the pressure criterion has been selected.

A *primary source* may be used when its radiation is required for other processes, e.g., in atomic absorption, atomic fluorescence or Raman spectroscopy.