Induction lamps have many of the same properties as fluorescent lamps. They are, however, slightly less efficient. The big advantage with this type of lamp is long life. This is because there are no electrodes to fail and the inside of lamp does not get coated with material that has been vapourised away from the electrodes. A number of lamps of this type have rated lives of 100,000 hours. These lamps are more expensive than conventional fluorescent lamps so they tend to be used in places where it is difficult to change lamps and thus long life is an important requirement.

3.3.9 Light emitting diodes

The basic operating principle behind light emitting diodes (LEDs) is covered in section 3.1.3. LEDs are available in a wide variety of sizes, colours and power ratings and development is proceeding at a rapid rate (see the Lighting Industry Federation LED Guide 2005 and the EBV Electronik and Philipslumileds web sites). Whilst LEDs come in a variety of styles, Figure 3.30 illustrates two common forms.

The main components of a LED are as follows.

The *chip* of semiconductor material in the centre of the lamp may be made of a wide variety of materials. Differing materials result in a different colour of light being produced Table 3.4 lists some of the more commonly used materials.

Table 3.4 Materials used in LEDs and the radiation produced

Materials	Radiation
Aluminum gallium arsenide (AlGaAs)	Red and infrared
Aluminum gallium phosphide (AlGaP)	Green
Aluminum gallium indium phosphide (AlGaInP)	Orange-red, orange, yellow, and green
Gallium arsenide phosphide (GaAsP)	Red, orange-red, orange, and yellow
Gallium phosphide (GaP)	Red, yellow and green
Gallium nitride (GaN)	Green, pure green (or emerald green), and blue
Indium gallium nitride (InGaN)	Near ultraviolet, green, bluish-green and blue
Zinc selenide (ZnSe)	Blue
Aluminum nitride (AlN), Aluminum gallium nitride (AlGaN)	Near to far ultraviolet
Diamond (C)	Ultraviolet

The chip is mounted onto one of the *lead in wires.* In high power LEDs the mounting is designed in such a way as to conduct heat away from the chip. The other lead wire is bonded to the chip generally connecting to a very small area close to the actual semi conductor junction. The whole device is then *potted* in a plastic resin, usually epoxy.