3.1.3 Electroluminescence

Some materials will convert electricity into light directly. Two major physical processes account for the majority of the various electroluminescence phenomena. They are the recombination of current carriers in certain semi-conductors and via the excitation of luminescent centres in certain phosphors.

Pure semi-conductors have intrinsically a very high resistivity and it is only when they are doped with other materials that it is possible to pass electricity through them. Some materials induce conduction by negatively charged carriers (n-type) and some by positively charged carriers (p-type). When charged carriers of different types recombine the energy released may be emitted as light. See section 3.3.9 for more information on light emitting diodes.

Some phosphors can be excited by electrical fields (usually an alternating field) to produce light. The most common material used is zinc sulphide generally doped with another metal such as copper. The process by which the radiation is created is not fully understood. However this has not stopped the process being used to make self luminous signs. For more information on electroluminescent light sources see section 3.3.10.

3.1.4 Luminescence

The term luminescence is sometimes also known as fluorescence, or photoluminescence. The process involves a material absorbing radiation and then re-emitting light. The energy may be re-radiated almost immediately or it may take several hours. There are a number of ways that the material can hold the energy and this impacts on length of the time the energy is stored and the amount of energy that is re-radiated.

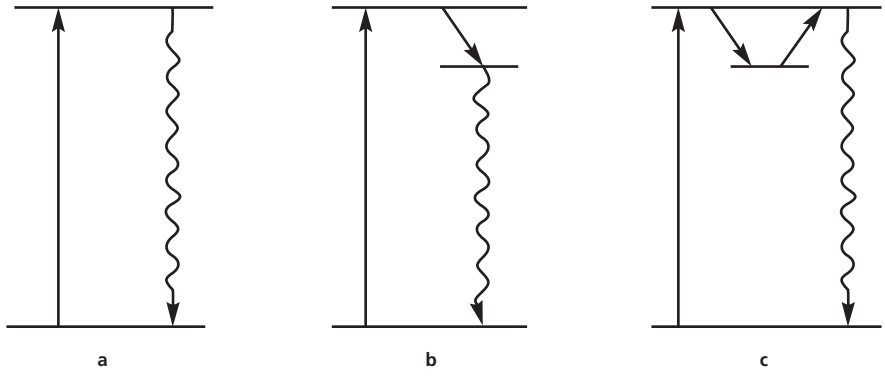

Figure 3.4 Simplified representations of energy level schemes in luminescence

In Figure 3.4 image (a) represents simple luminescence where the material absorbs the energy and the next transition is to re-radiate the energy. In (b) the some of energy in the material is lost via another process before re-radiation takes place. In (c) some of the energy is dissipated and the material falls into a state where it can not re-radiate until it is restored to the higher energy level. This process can lock energy into materials and is the basis of some 'glow in the dark' materials.

3.1.5 Radioluminescence

This occurs in a similar manner to luminescence but the primary source of the activation energy is particles or gamma rays emitted by a decaying nucleus of a radioactive atom.