Islamic University / Najaf
College of Medical Technology
Department of Radiology Techniques

Radiation Protection 1

Stage 2

Lecture 8

Radiation Detectors

By

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A dosimeter is an instrument used to measure ionizing radiation exposure (via alpha or beta particles, neutrons, gamma rays, or x-rays). It is a primary tool for people who work in situations where they are exposed to radiation. Dosimeters are used to ensure that a harmful dose of radiation is not received over a given period of time. The main goal of a dosimeter is to maintain an occupational dose as low. Radiation is extremely harmful to humans and can be deadly when people are exposed to high doses of radiation. Dosimeters inform and alert people when radiation levels are too high so that they can evacuate the exposure area and avoid radiation poisoning. In fact, the utilization of dosimeters is mandatory in nuclear power plants. Apart from being used in situations in which radiation is expected, dosimeters are also used in situations in which radiation is unexpected. The reagents are radiation detectors and personnel dosimeters, Radiation Detectors are Gas-Filled Detectors, Scintillators, and Solid State detectors. The types of personnel dosimeters are :

1-Thermoluminescent Dosimeters (TLDs)

A TLD dosimeter is used to measure the ionizing exposure of radiation. The way that a TLD dosimeter measures this exposure is through a TLD crystal that is embedded within its detector. This crystal emits a visible light when it is heated by radiation, and the more radiation exposure that the TLD crystal receives, the more intense the light that the TLD crystal emits will be. The intensity of this visible light is exactly what the TLD dosimeter measures, in order to calculate the

ionizing radiation exposure that the individual is surrounded by. This type of TLD dosimeter is mostly seen in use for monitoring the beta and gamma radiation that is emitted from x-ray machines.

Fig.1. TLD Dosimeter

2-Optically-Stimulated Luminescent (OSL)

An OSL dosimeter is an alternative to the thermoluminescent (TLD) dosimeter. OSL dosimeters are made from materials that are similar to a TLD dosimeter. Optically stimulated luminescence (OSL) is a process in which (exposed to ionizing radiation) material when subjected to an appropriate optical stimulation, emits a light signal proportional to the absorbed dose.

The wavelength of the emitted light is the characteristic of the

Fig.2. OSL Dosimeter

OSL material. OSL is thus analogous to thermo luminescence (TL) process except that the stimulation is carried out optically rather than thermally.

3- Electronic Personnel Dosimeters(EPD)

The electronic personal dosimeter (EPD) is a modern electronic dosimeter for estimating uptake of ionising radiation dose of the individual wearing it for radiation protection purposes. The electronic personal dosimeter has the advantages , such as continuous monitoring which allows alarm warnings at preset levels and live readout of dose accumulated. It can be reset to zero after use. These are especially useful in high dose areas where residence time of the wearer is limited due to dose constraints.

Fig.3. (EPD) Dosimeter

4- Film

Film dosimeters are used to measure radiation exposure to workers to monitor radiation safety and ensuring that they receive doses below the appropriate limit. Film badges are the cheapest and most common monitoring device. They consist of a small case with a piece of film situated between filters.

Fig.4. Film Dosimeters