

# OVERVIEW OF SOURCES OF RADIATION

Monika Khetarpal

Department of Physics, Government Dungar College, Bikaner, 334001 (Rajasthan) India

## Abstract

Our Earth is mainly composed of stable atoms meaning that the composition of protons and neutrons present in the nucleus is stable. There are some atoms present in the nature in which the composition of protons and neutrons is such that they are unstable. These unstable atoms are radioactive atoms. These radioactive sources generate radiations of varying energy. The type of radioactivity occurring on its own is regarded as natural radioactivity and the radioactive sources induced by man are termed as artificial sources. These two types of radioactive sources are discussed in this paper.

**Index Terms-** Radiations, Natural sources, artificial sources, applications, cosmic radiations

## I. INTRODUCTION

Atoms consist of central nuclei which contains protons and neutrons. Protons have positive charge and they repel each other. The strong nuclear force which is attractive and is present between the nucleons overcomes this electrostatic repulsive force. The situation where this attractive force is less than the electrostatic repulsion makes the nucleus unstable. Elements consisting of these unstable nuclei decay spontaneously emitting various radiations and the parent nucleus is transformed into one or more other elements. The resulting daughter nuclei have less mass and less energy than the parent nuclei. The sources of radiation are present all around and along with the natural sources there are some man-made sources. Radiation existed in the universe naturally, from the origination of time. Henry Becquerel firstly discovered it in 1896. Further in 1898 Madam Curie explained the concept and she got a Nobel Prize for her marvellous work in the field of radioactivity.

## II. RADIATION SOURCES

Human is exposed to radiations daily. If the level to these radiations is increased above a certain level then is extremely harmful not only for humans but it is harmful for all living organisms of the planet. There are several sources of radiations that can have moderate to high impact on health of creatures. There are two types of sources

### 1. Natural sources

Radiations are present in the environment and according to United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) there exist four main natural sources of radiation. These natural occurring sources of radiation are:

#### (i) Cosmic radiations:

Origination of cosmic rays is sun and other celestial events happening in the universe. They are constantly bombarding the earth's outer atmosphere. They are conventionally classified as primary and secondary cosmic rays. Primary Cosmic Rays are stable charged particles that have been accelerated to enormous energies by astrophysical sources somewhere in our universe. They consist mainly of protons (95%), alpha particles (4%) and with much smaller fluxes of heavy nuclei (1%). Secondary cosmic rays are generated by the interaction of secondary rays with atmosphere. Secondary cosmic rays comprise major part of gamma rays and number of elementary particles such as mesons, protons, neutrons, electrons and positrons.

**(ii) Terrestrial radiations:**

Terrestrial radiations are emitted from natural materials such as soil, clay and rock which consist of radioactive atoms like uranium, thorium and radium. As these radiations are present in building materials so exposure to these radiations can occur everywhere whether we are indoor or outdoor.

**(iii) Inhalation**

Radioactive materials are inhaled by human in the form of radioactive gases, which are liberated from radioactive substances found in soil and bedrock. Uranium-238 when decays a colourless and odourless radioactive gas is formed. It Radon does not interact with surrounding matter as it is inert gas. Radon gas rapidly moves up into the atmosphere. Another radioactive gas is thoron which is produced by thorium. Long term exposure of radon can lead to lung cancer.

**(iv) Ingestion**

A large amount of radiation enters our body through the food we eat and water we drink. Vegetables are grown in soil which contains radioactive materials and water used to nourish them also contains radioactive materials. Potassium-40 and carbon-14 are the radioactive materials present in each food.

**2. Artificial sources**

Artificial radiation sources are manmade sources. In addition to natural radioactive sources living organisms are exposed to radiations emitted by manmade sources. Man has produced various radioactive sources for their application in various fields. Some of the manmade sources are:

**(i) Medical sources**

Radiations has many applications in medicine, the well-known use is in X-ray machine. For treatment of cancer gamma rays are used. A person will be exposed to radiations of varying strength in these medical conditions.

**(ii) Industrial sources**

Radiations are greatly used in industry. The major application incorporates radiation gauging, smoke detectors and self-luminous objects.

**(iii) Nuclear fuel cycle**

Uranium is used in nuclear power plants to run a chain reaction, generating steam which further is employed by turbines for generation of electricity.

**(iv) Nuclear power**

Maximum radiation pollution occurs when nuclear explosion tests are done in the atmosphere. At the time of explosion tests number of radionuclides is liberated which spread out in the atmosphere. They get suspended in the air at a height of approximately 6 to 8km above the earth's surface. Due to rain they get settle down in soil and water and therefore enter the food chain. This is very harmful for health.

### (v) Atmospheric testing

Radioactive pollution occurred due to testing of nuclear weapons. Radioactive particles enter the environment and they settle down in the soil leading to harmful and dangerous effect to lives of living beings.

### III.CONCLUSION

The entire living organism from the beginning of time, have been and are still exposed to radiations. The radiations present are natural but a small fraction is man-made. The major sources of natural radiations are cosmic radiation, terrestrial radiation and the intake of radiation through inhalation and ingestion. It is spontaneous and uncontrolled. Whereas artificial sources are not spontaneous and they are manufactured for their medical applications, industrial applications and many more uses in varying fields.

### REFERENCES

- [1] United Nations Scientific Committee on the Effects of Atomic Radiation. (1988). Exposures from natural sources of radiation. In *Sources, effects and risks of ionizing radiation*.
- [2] Narayanan, K. K., Krishnan, D., & Subba, R. (1991). *Population exposure to ionising radiation in India* (No. ISRP-K-BR--3). Indian Society for Radiation Physics.
- [3] Lawson, R. S. (1999). An introduction to radioactivity. *UK: Manchester royal infirmary*.
- [4] Little, M. P. (2003). Risks associated with ionizing radiation: Environmental pollution and health. *British medical bulletin*, 68(1), 259-275.