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Measurement of Radon Exhalation Rate, Natural Radioactivity, and Radiation Hazard Assessment in Soil Samples from the Surrounding Area of Kasimpur Thermal Power Plant Kasimpur (U. P.), India

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Abstract : In coal fired thermal power stations, large amount of fly ash is produced after burning of coal. Fly ash is spread and distributed in the surrounding area by air and may be deposited on the soil of the region surrounding the power plant. Coal contains increased levels of these radionuclides and fly ash may increase the radioactivity in the soil around the power plant. Radon atoms entering into the pore space from the mineral grain are transported by diffusion and advection through this space until they in turn decay or are released into the atmosphere. In the present study, Soil samples were collected from the region around a Kasimpur Thermal Power Plant, Kasimpur, Aligarh (U.P.). Radon activity, radon surface exhalation and mass exhalation rates were measured using “sealed can technique” using LR 115-type II nuclear track detectors. Radon activities vary from 92.9 to 556.8 Bq m-3 with mean value of 279.8 Bq m-3. Surface exhalation rates (EX) in these samples are found to vary from 33.4 to 200.2 mBq m-2 h-1 with an average value of 100.5 mBq m-2 h-1 whereas, Mass exhalation rates (EM) vary from 1.2 to 7.7 mBq kg-1 h-1 with an average value of 3.8 mBq kg-1 h-1. Activity concentrations of radionuclides were measured in these samples by using a low level NaI (Tl) based gamma ray spectrometer. Activity concentrations of 226Ra 232Th and 40K vary from 12 to 49 Bq kg-1, 24 to 49 Bq kg-1 and 135 to 546 Bq kg-1 with overall mean values of 30.3 Bq kg-1, 38.5 Bq kg-1 and 317.8 Bq kg-1, respectively. Radium equivalent activity has been found to vary from 80.0 to 143.7 Bq kg-1 with an average value of 109.7 Bq kg-1. Absorbed dose rate varies from 36.1 to 66.4 nGy h-1 with an average value of 50.4 nGy h-1 and corresponding outdoor annual effective dose varies from 0.044 to 0.081 mSv with an average value of 0.061 mSv. Values of external and internal hazard index Hex, Hin in this study vary from 0.21 to 0.38 and 0.27 to 0.50 with an average value of 0.29 and 0.37, Respectively. The results will be discussed in light of various factors.

Keywords : natural radioactivity, radium equivalent activity, absorbed dose rate, gamma ray spectroscopy
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