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An Investigation on the Natural Radioactivity of Building Materials, Raw Materials and Interior Coatings in Central Turkey

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Abstract: Aim: The aim of this investigation was to measure the amount of g-decay of several building materials (brick and cement), raw materials (fly-ash and soil), interior coating materials (foam [used as a thermal insulator], water-based paints, solvent-based paints and phosphogypsum) from central Turkey, in terms of Bq kg⁻¹, and to calculate the biological damage caused by this radioactivity. Materials and Methods: Gamma-spectrometry technique has been used throughout the research in order to determine the activity of natural radionuclides. Later, annual doses were calculated. Results: The average radioactivity values were 632.2 Bq kg⁻¹ for fly-ash, 4.4 Bq kg⁻¹ for brick, 73.3 Bq kg⁻¹ for soil, 306.6 Bq kg⁻¹ for cement, 302.3 Bq kg⁻¹ for phosphogypsum and 83.6 Bq kg⁻¹ for solvent-based paint in the research region. The activity of water-based paint and foam were below MDA¹. The annual effective doses ranged between 0.009 and 1.479 mSv y⁻¹. Conclusions: These results show that annual dose absorbed by inhabitants from construction materials used in central Turkey per kilogram is below 1.0 mSv y⁻¹. However, the dose from fly-ash, a component of cement, is generally over this value. Moreover, H_{in}² of phosphogypsum is over the limit, which means it is harmful for the respiratory system. As a result, the issue needs more research, taking into account the density, thickness of walls and percent contribution of fly-ash used in cement and also taking more samples.

Key Words: Gamma-Irradiation, natural radioactivity, building materials, biological damage, annual effective dose

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