



Gamma spectroscopic analysis and associated radiation hazards of building material used in Vientiane capital, Lao PDR

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Abstract

Radiation exposure of the population can be increased appreciably by the use of building materials (brick, cement and sand) containing above-normal levels of naturally occurring radionuclides of terrestrial origin. The radioactivity were determined via gamma-ray spectrometry using a High-Purity Germanium (HPGe) detector. The natural radioactivity levels of 50 samples of natural and manufactured building materials used in Vientiane capital, Lao PDR were collected from local market and construction sites and further investigated. From the measured gamma-ray spectra, activity concentrations were determined. The radioactivity ranged from 23.25 ± 4.63 to 39.88 ± 5.66 Bq.kg⁻¹ for ²²⁶Ra, from 10.10 ± 3.59 to 49.52 ± 5.34 Bq.kg⁻¹ for ²³²Th and from 131.93 ± 9.45 to 568.16 Bq.kg⁻¹ for ⁴⁰K. The obtained data were compared with the corresponding reported data of other countries. The radium equivalent activity Ra_{eq}, the external hazard index (Hex) and the absorbed dose rate in air D in each sample was evaluated to assess the radiation hazard for people living in dwelling made of studied materials. All building materials have shown Ra_{eq} (range from 66.41 to 152 Bq.kg⁻¹). These values are lower than the limit of 370 Bq.kg⁻¹ adopted by the Organization for Economic Cooperation and Development (OECD). The absorbed dose rate in indoor air is slightly higher comparably to the recommended worldwide value. All the materials examined are acceptable for use as building materials as defined by the OECD criterion.

Keywords: Natural radioactivity; Building materials; Activity concentration index.