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ST05

ENVIRONMENTAL IMPACT OF GASEOUS EMISSIONS (AIR POLLUTION AND MONITORING, RN AND ENVIRONMENTAL RADIOACTIVITY)

REFERENCE: MARCELLO LIOTTA

α -radiation from home building materials likely affecting human health in Northern Vietnam

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Radon is a radioactive gas that is widely generated in rocks, soils, and building materials. It has been recognized as the second most important factor triggering lung cancer, after smoking as the leading cause. This survey (i) quantifies the nuclide-specific α -radiation of ²²²Rn (radon) and ²²⁰Rn (thoron) in common types northern Vietnamese houses constructed with different materials, and (ii) evaluates the total annual effective dose rate of indoor α -radiation for inhabitants. Surveyed homes were built with traditional local materials such as clay, soil, stone and crushed limestone. Measurements of both radon and thoron were performed with a SARAD[®] RTM 2200 in different types of houses in the center of rooms and near walls.

The average total ²²²Rn abundance in indoor air of all types of homes was < 100 Bq m⁻³, but ²²⁰Rn concentrations were far higher than ²²²Rn and expressed a trend of increasing values from the center of rooms to locations closer to interior walls. Thoron concentrations peaked close to walls built from compacted and dried soil, unfired-clay bricks and bricks made from crushed limestone. A maximum thoron concentration of up to 1052 Bq m⁻³ was measured in air close to a wall of unfired-soil bricks. The thoron levels in the center of rooms without wall coverings (i.e. exposing the raw building materials) exceeded 150 Bq m⁻³, 15 times higher than the average environmental level of 10 Bq m⁻³ for thoron [UNSCEAR, 2000]. In contrast, thoron in the center of rooms was below the detection limit when walls were constructed with fired-clay bricks or concrete, and was 86 Bq m⁻³ when compacted soil walls had been covered with a layer of plaster.

The total annual effective dose rates from radon and thoron and their progenies to inhabitants who spend about 13 hours per day in the various types of houses in northern Vietnam are estimated to be higher than 10 mSv a⁻¹ in houses where raw building materials are exposed on walls, especially up to 37 mSv a⁻¹ for houses built with compacted soil. A range from 6.5 to 9.5 mSv a⁻¹ is estimated for houses constructed with fired-clay bricks or where walls are covered with plaster. The total excess lifetime cancer risks from indoor α -radiation in affected northern Vietnamese homes range from about 20×10⁻³ to 130×10⁻³, which is much higher than the world average of 1.45×10⁻³ [ICRP, 1991; Shausha and Ahmad, 2016]. Practical mitigation strategies are needed to reduce indoor α -radiation from thoron in many traditional homes in northern Vietnam.

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