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Radioactivity Measurements of Ceramic Tiles Produced in Serbia

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Building materials may contain to some extent naturally occurring radioisotopes 226Ra, 232Th (from uranium and thorium decay chain) and primordial radioisotope 40K. Those materials are often referred to as NORM (Naturally Occurring Radioactive Materials) [1, 2]. Owing to the presence of radioisotopes, using NORM in buildings can present a potential health risk to the population, due to the gamma radiation and indoor radon (222Rn). For the purpose of radiological protection, monitoring of used building materials is necessary [3]. Averaged values of the activity concentration of 226Ra, 232Th and 40K in building materials worldwide are 50 Bq kg-1, 50 Bq kg-1, and 500 Bq kg-1, respectively [4]. Ceramic tiles in Serbia are mainly used for covering floor and wall surfaces in domestics, as well in residential places. Regarding the frequent use of ceramic tiles as building materials, the measurements of the level of radioactivity are necessary in order to estimate potential health hazard for the population.

The main goals of the paper are measuring the level of radioactivity of some ceramic tiles produced in Serbia and determination of radiological risk, in order to estimate health risk originated from mentioned materials in domestic and residential spaces.

This paper presents the results of gamma spectrometry measurements of natural radionuclides (226Ra, 232Th and 40K) in some floor and wall ceramic tiles produced in Serbia and used in homes and business premises. The level of radioactivity of some ceramic tiles produced in Serbia by two major manufacturers – Zorka Keramika and Toza Markovic was examined. The measured mean value of the activity concentration of 226Ra, 232Th, and 40K exceed the average values in the world for building materials with values of 67.2 \pm 6.9 Bq kg-1 for 226Ra, 57.4 \pm 4.7 Bq kg-1 for 232Th and 808 \pm 48 Bq kg-1 for 40K. Based on these calculated values, the representative level index – gamma index, associated with gamma radiation, whose average value is 0.78 \pm 0.06 and annual effective dose, whose average value is 0.117 \pm 0.009 mSv y-1 for homes and 0.034 \pm 0.002 mSv y-1 for business premises were obtained. Estimated values fulfill all the recommendations of the European Commission for building materials, thus analyzed materials are considered not to be a health hazard for the public.

References

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Primary authors: Prof. KUZMANOVIĆ, Predrag (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia & Academy of applied studies Šabac, Department of medical and business-technological studies, Laboratory for Physics, Šabac, Serbia); Dr FORKAPIĆ, Sofija (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia); Dr ČELIKOVĆ, Igor (University of Belgrade, Vinča Institute of Nuclear

Sciences, Laboratory for Nuclear and Plasma Physics, Box 46, Belgrade, Serbia); Prof. MRĐA, Dušan (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia); Dr BIKIT, Kristina (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia); Dr HANSMAN, Jan (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia); Dr KNEŽEVIĆ RADIĆ, Jovana (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia);

Presenter: Prof. KUZMANOVIĆ, Predrag (University of Novi Sad, Faculty of Sciences, Department of Physics, Novi Sad, Serbia & Academy of applied studies Šabac, Department of medical and business-technological studies, Laboratory for Physics, Šabac, Serbia)

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