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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  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  (from uranium and thorium decay chain) and primordial radioisotope  $^{40}\text{K}$ . 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 ( $^{222}\text{Rn}$ ). For the purpose of radiological protection, monitoring of used building materials is necessary [3]. Averaged values of the activity concentration of  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  in building materials worldwide are  $50\text{ Bq kg}^{-1}$ ,  $50\text{ Bq kg}^{-1}$ , and  $500\text{ Bq kg}^{-1}$ , 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 ( $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ ) 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  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ , and  $^{40}\text{K}$  exceed the average values in the world for building materials with values of  $67.2 \pm 6.9\text{ Bq kg}^{-1}$  for  $^{226}\text{Ra}$ ,  $57.4 \pm 4.7\text{ Bq kg}^{-1}$  for  $^{232}\text{Th}$  and  $808 \pm 48\text{ Bq kg}^{-1}$  for  $^{40}\text{K}$ . 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  $0.117 \pm 0.009\text{ mSv y}^{-1}$  for homes and  $0.034 \pm 0.002\text{ mSv y}^{-1}$  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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