

BOOK OF ABSTRACTS



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First attempts to assess the radiological risk due to the presence of natural radionuclides in construction and building materials used in Uruguay

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^{40}K and the radionuclides of the ^{238}U and ^{232}Th series are present in the earth's crust, and therefore are components of the construction materials that are made from it. Radioactivity from building materials together with radioactivity from the ground are the major sources of exposure of the population to ionizing radiation. In this work we report, for the first time, the activity concentrations of ^{226}Ra , ^{232}Th and ^{40}K in different construction materials marketed in Uruguay. Portland cement, prepared cement mixtures, gypsum, bricks, blocks (concrete and clay), fibre cement, sand and tiles were purchased in the market, quartered, ground and stored for four weeks in containers with Marinelli geometry, in order to reach secular equilibrium between ^{226}Ra and its decay products. The activity concentrations of ^{226}Ra , ^{232}Th and ^{40}K was quantified by gamma spectrometry using a gamma spectrometry system with a high purity germanium detector (HPGe) ORTEC-AMETEK, GMX35P4-76-RB. The activity concentration ranges for the three natural radionuclides are shown in Table 1. To evaluate the excess of gamma radiation due to the use of construction materials, the activity concentration index (I) was used according to European regulations, since there are no national regulations.

Table 1: Activity concentrations of ^{226}Ra , ^{232}Th and ^{40}K and activity concentration index (I) for different materials available in the Uruguayan market. LD = limit of detection.

Material	^{226}Ra (Bq.kg ⁻¹)	^{232}Th (Bq.kg ⁻¹)	^{40}K (Bq.kg ⁻¹)	I
Cements and mixtures	< LD – 38.8	< LD – 15.0	148–384	< LD – 0.32
Structural elements (bricks and blocks)	8.8–45.7	23.5 – 49.5	210–518	0.32–0.57
Gypsum and fibre cement	3.5–13.6	4.6–12.1	43.7–296	0.024–0.37
Tiles (ceramic and porcelain)	34.6–69.2	50.3–93.0	700–800	0.64–0.96

A value that exceeds the recommended value ($I < 1$) implies that the reference level of equivalent effective annual dose of 1 mSv.yr^{-1} has been exceeded, and that it is not recommended to use this material for housing construction, although it may be used for other purposes. Although materials whose activity concentration index exceeds the recommended value have not been evaluated up to now, further studies are necessary to guarantee the radiologically safe use of building materials in Uruguay, and to establish the pertinent standards.

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