

2012



RAD

The First International
Conference on
Radiation and Dosimetry in
Various Fields of Research

APRIL 25 - 27, 2012
FACULTY OF ELECTRONIC ENGINEERING | NIŠ | SERBIA

**BOOK OF
ABSTRACTS**

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THE CONTENT OF NATURAL RADIONUCLIDES IN LIGNITE SAMPLES FROM OPEN PIT MINES “KOLUBARA”, SERBIA

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Coal as the most widely used fossil fuel contains traces of naturally occurring radioactivity from uranium and thorium series and ⁴⁰K. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimated that average concentrations in coal worldwide are 50 Bq/kg for ⁴⁰K and 20 Bq/kg for both ²³⁸U and ²³²Th (range 5 Bq/kg – 300 Bq/kg). [1]

Activity concentrations of naturally occurring radionuclide ⁴⁰K, ²³⁸U and ²³²Th for three groups of samples of coal and mineral matter mixed with coal (I (2008 year – 30 samples), II (2009 year – 26 samples) and III (2010 year – 26 samples)) are presented in this paper. Representative samples of different coal quality were especially collected at different locations at open pit mines in RB “Kolubara” which has annual production of 29 millions tones of lignite for the power generation at TPP “Nicola Tesla”, Obrenovac.

The samples were pulverized, dried and sealed in Marinelli plastic boxes 0.5 l, and stored for forty days until radioactive equilibrium between ²²⁶Ra and its decay products were achieved.

All samples were measured by means of coaxial germanium HPGe detector (ORTEC GEM-30, 30 % relative efficiency and 1.8 keV resolution for ⁶⁰Co at 1332 keV line). The detector was calibrated using standard solutions with radionuclide activities certified by CMI [2]. The experimentally obtained spectra were processed using Canberra’s Genie2000 software.

The activity concentrations of ²³⁸U and ²³²Th were determined indirectly from the gamma-rays emitted by their progenies while ⁴⁰K was determined directly by its gamma-line of 1460.8 keV.

Table: Activity concentrations of natural radionuclide in coal samples from open pit mines “Kolubara”

Coal samples		²³⁸ U [Bq/kg]	²³² Th [Bq/kg]	⁴⁰ K [Bq/kg]
I(2008)	range	16.86 -86.38	11.82 - 44.30	25.86 – 312.53
	average ± σ	39.19 ± 2.31	24.84 ± 1.57	134.57 ± 7.55
II(2009)	range	0.77 – 52.68	5.10 – 48.30	17.30 – 495.87
	average ± σ	24.99 ± 3.14	20.13 ± 0.47	139.67 ± 11.67
III(2010)	range	2.26 - 84.79	10.55 – 58.52	19.13 – 290.9
	average ± σ	30.71 ± 4.92	21.59 ± 0.71	95.25 ± 3.44

It can be seen from this table that the measured coal samples have low activity concentrations and the artificial radionuclides were not detected. The obtained activity concentrations of naturally occurring radionuclides in analyzed coal samples are comparable with those in coals from other countries [3, 4].

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