ENVIRONMENTAL RADIOLOGICAL ASPECTS OF THE COAL MINING IN PÉCSBÁNYA (SOUTH HUNGARY)

KÓBOR, B.[1], GEIGER, J.[2] & PÁL MOLNÁR, E.[1]
[1] Department of Mineralogy, Geochemistry and Petrology, University of Szeged, P. O. Box 651, H-6701 Szeged, Hungary.
E-mail: koborb@hotmail.com
[2] Department of Geology and Paleontology, University of Szeged, P. O. Box 651, H-6701 Szeged, Hungary.

It has been known since the first set of Hungarian radiological and geochemical research carried out in connection with uranium prospecting that the radioactive element concentration of some coals (some brown coals in the Tatabánya Basin, the coal of Ajka, and the Liassic coal in the Mecsek Mts.) are significantly above the average (SZALAY, 1962). During the 200 years of coal mining in the vicinity of Pécs (Mecsek Mts., South Hungary) materials with radioactivity levels higher than that of the environment were brought to the surface in vast quantities. The exact radiological assessment of the areas in question, the maintaining of the radioactive "zero level" of the territory, and the determination of the quality and quantity of the radioactive over-radiation of the population is necessary for the successful and effective re-cultivation of the areas affected by mining.

We carried out total-gamma dose-capacity scaling and gamma-spectrometry survey in a 50 x 50 metre grid in accordance with the proposals of the International Atomic Energy Agency (IAEA), in the Pécsbánya Karolina opencast mining area, in the neighboring uncovered, landscaped, and uncultivated dumps, coal stocks, as well as in the entire area of the town of Pécsbánya. As a result of our winter-summer "in situ" measurement series we constructed the total-gamma dose-capacity map of the Karolina opencast mine and its surroundings for winter and summer, characterised by significantly diverse meteorological conditions. According to our findings the radioactive "zero level" of the distant surroundings of the opencast mine in relation to the total-gamma dose-capacity is 90–92 nGy/h in the dry, hot summer, and 85 nGy/h in the wet, cold winter. The values of total-gamma dose-capacity in the areas currently being stripped are 45–55% and on the waste stockpiles 20–25% higher than those of the distant surroundings. Those waste stockpiles which are permanently landscaped and covered with a 40–60 cm thick soil layer absorb the radioactive over-dose almost entirely: values measured there are higher than the radioactive "zero level" by a mere 2–5%. The highest levels of total-gamma radiation were measured on old burned, parched dumps, which are often left uncultivated. Mining raises the radioactivity levels of the close surroundings by 20–25%.

The gamma-spectrometric measurements of the collected rock specimens under laboratory conditions reveal that the higher level of radiation is caused by the high K^{40}-content in the case of claystones, aleurolites and sandstones, and by high uranium and thorium content in the case of coal and coal sandstones rich in organic matter. Out of the rocks of the opencast mine, those rich in clay minerals and organic matter at the same time, have the highest K^{40} and Th content above the global average (SWAINE, 1990).

References

SWAINE, D. J. (1990) Trace elements in coal. Butterworths. London. 278 p.

SZALAY, S. (1962): Papers of the Engineering Department of the Hungarian Academy of Sciences. Budapest, pp. 168-185.