MIGRATION PROPERTIES OF RADIONUCLIDES IN THE SOILS POLLUTED

R.N.Mechdieva, B.A.Suleymanov, R.Q.Abaszade
Institute of Radiation Problems of ANAS, Baku, Azerbaijan

1. INTRODUCTION

Due to the fact of long-term oil production some local polluted zones exist on Apsheron peninsula. The reasons of this pollution vary depending upon the place of pollution. The territory of Romani Iodine plant was selected as the object of investigation. This area was polluted as a result of iodine production process as well as of the influence of stratal water coming with extracted oil.

Iodine element is accumulated as other radionuclides in composition of stratal water extracted with oil from ground substratum. During the process of iodine separation from water for its usage in production, water is run through coal. After absorption process coal is placed in the open air. Being in the open air under the influence of rain and other external action coal looses its sorption ability and changes the natural radioactive background of the given territory. The task of the investigation is to determine the changed radioactive background and to set the reasons of this change. It has been observed that the radioactive background at this territory in the source differs from that one at the distance from the source. The main reason of the natural radioactive background change in the same areas lies in the fact that different elements spreading in the course of time ionizing radiation exist in ponds created as a result of stratal water accumulation during industrial process, in the content of coal used as the sorbent in production process and also in the content of stratal water extracted from the ground substratum. This reason was shown by us as the primary fact. The reason of this radiation is the existence of K_{40} (half-decay period $1,2 * 10^9$ year), Th_{232}($1,6 * 10^3$year), Ra_{226} ($1,41 * 10^{10}$year) isotopes in stratal water.

2. SAMPLING METHOD

It's known that the influence of radionuclides in soil is changing as a rule by expotential law. During the first months after radionuclides penetrate in soil the expotential coefficient is equal to several units μ(sm2/q), but over the years it decreases. Radionuclides can not influence the fir soil at the depth more that 10 sm. But in ploughed, soft soil radionuclides are spread approximately uniformly and can influence it at the depth of 20-30 sm.

The sampling was carried in the definite direction taking into consideration the landscape conditions of traces determined basing upon the primary forecast of radioactive wastes.
The samples are taken with special sampler with area $50sm^2$ so that the further sampling with more volume is easier.

From the first stage of the investigation the territory was studied and numbered being previously subdivided to small areas. In numbered areas the radioactive background was measured at the distance 1 m above the ground surface by means of **СРП** - 88 dosimeter, the strength of exposure dose was determined and marked. After that the soil samples were taken at the depth of 10-20 m in the noted point by means of the dosimeter. It should be noted that in abovementioned areas firm soil existed together with the soft one. The samples are collected in special packets with their number, the place of taking and EDG. The natural radioactive background of the territory was measured in different points and so according to these measurements the radiological map of the territory was drawn up. Radionuclide content and activity of the samples were identified by gamma spectrometer. The samples were measured by means of clean GE detector, multi-channel analyzer (8192). Investigation process in gamma spectrometer is wholly automatized and provides practical error 10%. Taken soil samples were pounded and in order to liquidize the humidity in the samples they were dried in **СПТ**-200 kiln at the temperature 400S°.

3. METHOD OF EXPERIMENT

While taken with special ampoules from dried soil in equal volume EPR spectrums of the samples were studied. The objective of the investigation was to study the existence of the definite relation between radioactive background change and the creation of paramagnetic centre. The spectrums were made by PG 1306 radiospectrometer at room temperature in x diapason *(λ=3sm)*.

4. RESULTS AND THEIR ANALYSIS

The results of the measurements were shown in the table

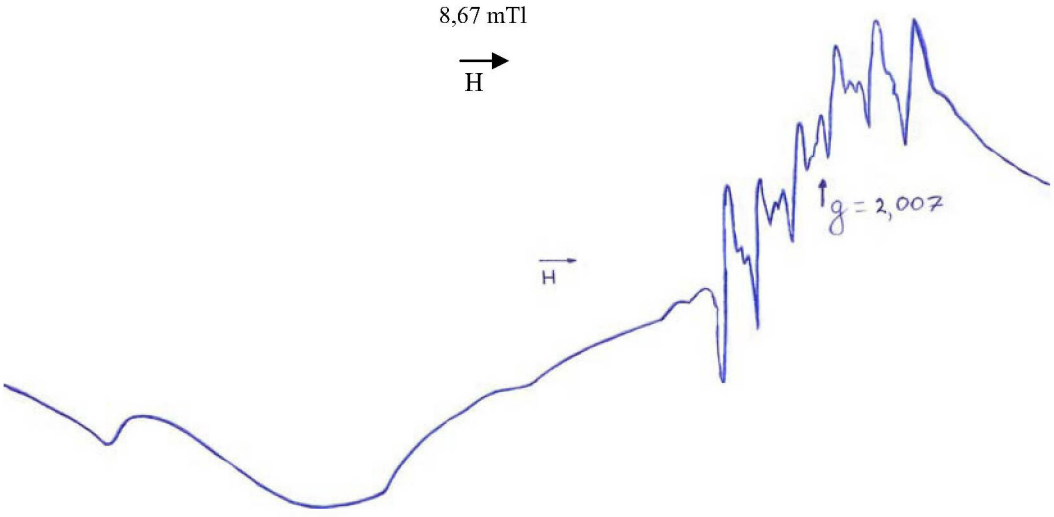
Number	Radioactive background	Organic part g=2,007	6 band part g=2,01	Broad cpectrum
1	11 mkR/h			
2	17 mkR/h			
3	15	1	1	1
4	19 mkR/h	5	13,8	8,6
5	25 mkR/h	-	2,2	8,6
6	31 mkR/h	10,2	6,1	0,4
7	50 mkR/h	5,5	6,4	7,8
8	300 mkR/h	-	-	6,4
9	965 mkR/h	-	-	7,7

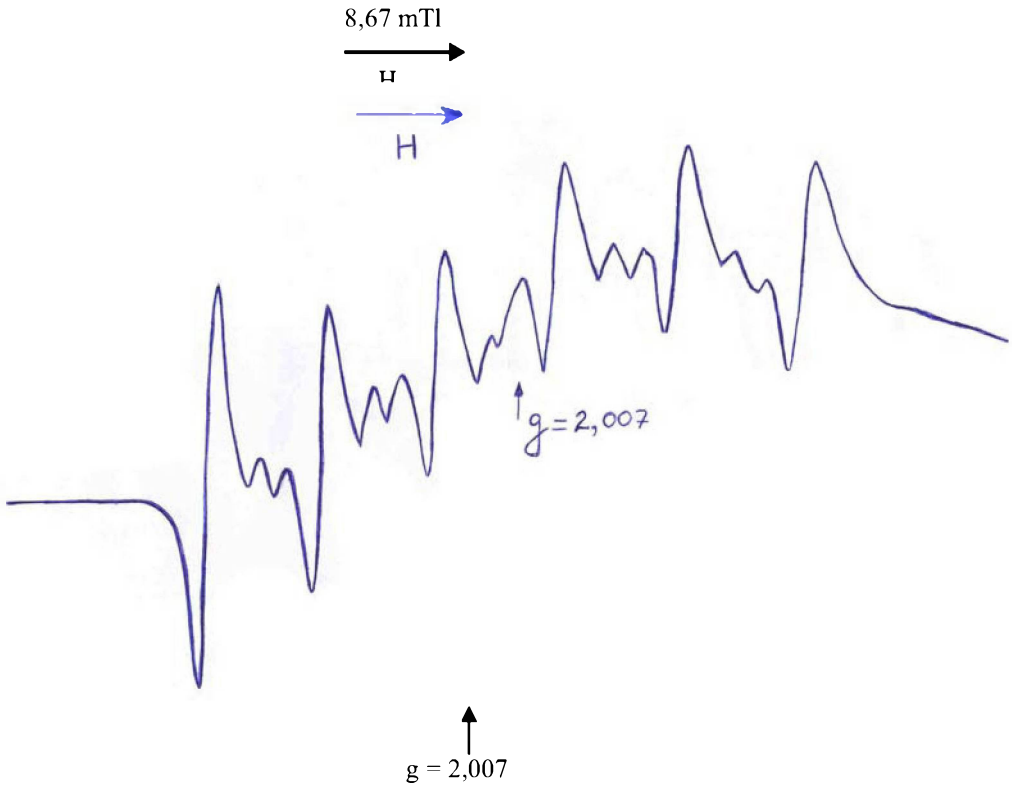
For the measurements Mn^{2+} ions in MgO were taken as the standard. g factor is calculated by the following formula.

$$g = \frac{g3(a+1)}{\frac{g3}{g4} * a + 1} \qquad (1)$$

g3 and *g4* are correspondingly factors of hyperfine structure bands and *a* is the parameter showing the place of unknown sample.

A received spectrum has very complicated content. The specific structure of the spectrum is show in the picture. In the picture a) the general form the spectrum is shown, (b) the part with hyperfine structure structure was shown in more detailed form.





EPR spectrum has complicated structure. This spectrum is the result of signals coming from 3 paramagnetic centers and superimposed signals. The following signal can be seen in the given spectrum: signal relating to 6 hyperfine structure bands, singlet weak signal and singlet broad signal. This signal can be identified in the following way:

a) The signal in the spectrum consisting of 6 bands relate to Mn^{2+} ions. Its g factor 2,01; number of bands (6) and STS constants wholly correspond with standard's meanings.
b) The singlet situated between the third and the forth band relates to the radicals of organic part in soil. It means radicals in humus acid. (g=2,007; $\Delta H=0,8mTl$);
c) Broad signal observed in the spectrum is very intensive. The chemical source of this signal is non identified

As it's seen from the table there is no any correlation between radioactive background change and change of paramagnetic center doze. So this fact shows that paramagnetic centers are not radioactive. For the identification of chemical source of broad spectrum the other methods are being used at the moment.

5. REFERENCES

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