

## Spectral Characterization of the Romanian Bottom Black Sea Sediments Contaminated by $^{137}\text{Cs}$

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**ABSTRACT.** Bottom sediments sampled on the Romanian Black Sea coast, by X-R diffraction, EPR (Electronic Paramagnetic Resonance) and IR (Infra-Red) spectra were investigated in view to explain the higher accumulation of  $^{137}\text{Cs}$  in front of Portitza site Razelm lagoon.

**INTRODUCTION.** The aim of this research is to carry out the investigation on the mineralogical nature of the silty clay sediments sampled on the bottom of the Black Sea Romanian coast, aerobic oxydo-reduction zone. This in view to explain the higher accumulation of  $^{137}\text{Cs}$  30 y important by its accumulation in the biota, especially at Portitza Razelm lagoon, very rich in fishing activities. The chemical composition with the grain size as well as with the retention and exchange of man made radionuclides between crystalline lattice and the soluble form of the radionuclide in water, in previous paper has been discussed (1-2).

**MATERIAL AND METHODS.** Marine sediment samples were collected at  $45^{\circ}08'N$   $29^{\circ}57'E$  to  $44^{\circ}08'N$ ,  $28^{\circ}57'E$  coordinates, offshore 13.2 to 17.3 marine Miles at Portitza. Other characteristics at Portitza: liquid discharge of Danube river,  $Q=6830 \text{ m}^3/\text{s}$ , on the bottom sea water temperature  $t = 6.5^{\circ}\text{C}$ , water salinity  $S=18.23\%$ , flow current  $V=8 \text{ cm/s}$ , direction  $\alpha = 100^{\circ}$ . The grain size of the silty clay was  $70 +80 \mu\text{m}$ . The dried sediments at  $105^{\circ}\text{C}$  were submitted to the following investigations: X-ray diffraction carried out by a TUR M-72 installation with the  $\text{CuK}\alpha$  radiation, EPR (Electronic Paramagnetic Resonance) by means of a EPR Spectrometer ART-5 IFIN-Bucharest type with X-band frequency and IR (Infra-Red) spectra registered in the band of  $200-4000 \text{ cm}^{-1}$ , making use of a PERKIN-ELMER apparatus type, the samples being packed in KBr.

### RESULTS AND DISCUSSION.

- In TABLE 1 are included the results concerning the mineralogical composition of the bottom sediments sampled during June 1989, established by X-ray diffraction. It is to be outlined only at Portitza site in the silty clay are to be found the highest content of illite, but lower content in calcite, favorable to accommodate in the crystalline lattice the Cesium ions. On the other hand, by INAA analysis only in this region 8 ppm of stable Cs was found (3). It is known the radionuclide follows the pathway of its stable counterpart.

TABLE 1. Identified minerals by X-Ray diffraction in bottom sediments of the Romanian Black Sea coast, 1989

Sample	$\beta$ -Quartz	Calcite	Illite	Kaolinite	Feldspath
Sulina	+++	++	+	-	-
St.Gheorghe	++	++	+	+	++
Portitza	+++	+	++	+	-
Constantza	+++	++	+	+	-

- From IR spectra the following conclusions can be drawn: the calcite ( $\tilde{\nu}_3 = 1460 \text{ cm}^{-1}$  and  $\tilde{\nu}_2 = 710 \text{ cm}^{-1}$ ) in the sample is decreasing as follows: Constantza > Sf.Gheorghe > Sulina > Portitza. Lower content in calcite at Portitza explains higher concentration of Cs and  $^{137}\text{Cs}$ . The illite was identified ( $\tilde{\nu}_{\text{Si-O-Si}}$ ,  $\text{Si-O-Al}$  at  $\tilde{\nu} = 1020-1100 \text{ cm}^{-1}$  and  $\delta = 420-520 \text{ cm}^{-1}$ , while Kaolinite at  $\tilde{\nu} = 3600 \text{ cm}^{-1}$ . The illite is present at every sampling station also more concentrated at Portitza. By IR spectra it was not observed the characteristic vibrations of any organic pollutants in the samples.

- EPR spectra shown the  $\text{Fe}^{3+}$  and  $\text{Mn}^{2+}$  ions. The highest content of  $\text{Fe}^{3+}$  about 4% (3) is related to illite presence. The presence of  $\text{Cr}^{3+}$  is also discussed. In all sediment samples except those of Constantza, the EPR characteristic signal was put in evidence the organic matter named Kerogen disseminated in sedimentary facies rocks, generator of petroleum (4). The highest signal of Kerogen was at Portitza sampling site.

### REFERENCES

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