

**Fission track measurements of uranium concentration and distribution in the Mussel *Mytilus galloprovincialis* and some macrophytes from the Romanian Sea Coast, 1987-1990**

Iulia I. GEORGESCU\*, Marjana CIUBOTARIU\*\* and Ana DANIS\*\*

\*Polytechnical Inst., Fac. of Chemical Technology, BUCHAREST (Romania)

\*\*Institute of Physics and Nuclear Engineering, BUCHAREST (Romania)

**Abstract**

The bivalve mollusc *Mytilus galloprovincialis* and the macrophytes *Enteromorpha linza*, *Cystoseira barbata* and *Ceramium rubrum* were analyzed for uranium by the fission track micro-mapping technique. Pending on the site sampled, a variation in uranium concentration was found in *M. galloprovincialis* which decreased from the north to south along the coast of Romania. In the macrophytes, uranium distribution was generally uniform except for *C. rubrum* in which U is found as inclusions.

**Introduction**

In a previous research (DANIS *et al.*, 1979), the uranium distribution and content in Black Sea rocks, sediments and water were determined by the fission track method. These results, along with those of other investigators (Georgescu *et al.*, 1990) on the uranium content in different biota, permit us to discern the uranium distribution in the mussel *Mytilus galloprovincialis*, the macrophyte *Enteromorpha linza* (*Ent.l.*), *Cystoseira barbata* (*Cyst.b.*) and *Ceramium rubrum* (*Cer.r.*) from the Black Sea during 1987-1990.

**Materials and Methods**

Mussels of 4-5 cm length were sampled from different depths along the Black Sea Romanian shoreline during 1987-1990. The soft tissue and the byssus were dissected and dried at 105°C. Measurements of U distribution and content were performed using the uranium micro-mapping technique. Uranium micro-mappings were obtained both for natural and powdered dry samples in the following way: the samples, placed in intimate contact with the muscovite track detector sheets, were irradiated with thermal neutrons at fluxes of  $\approx 10^{14}n\text{ cm}^{-2}$  in the VVR-S reactor in Bucharest. During neutron irradiation, the fission fragments from the neutron induced fission of the uranium nuclei were corded by trails in the muscovite detectors. These tracts were observed by optical microscopy following chemical etching by HF $\geq$ 38% for 4 hours at room temperature. Thus, in muscovite detectors the fission track replica of the uranium distributions were obtained (Fig.1). The SL-1 IAEA Certified Reference Material was used in the determinations of U content in the samples. For each sample analyzed, three separate analyses were performed.

**Results and Discussion**

1. In all samples of mussel, uranium was more concentrated in the soft tissues than in the byssus.

2. A decrease of U concentrations was observed in mussels going from the north to the south along the Romanian Black Sea shore. During 1987, this variation ranged between  $0.21 \pm 0.03$  ppm to  $0.11 \pm 0.03$  ppm in the soft tissue. In the byssus, a mean value of  $0.07 \pm 0.01$  ppm was observed.

3. During 1989 in the southern Danube Delta at Portitza, elevated uranium levels ( $0.89 \pm 0.13$  ppm) were observed in the soft tissue of mussels which is assumed to be due to contamination.

4. In most of the macrophytes analyzed, uranium was uniformly distributed, except in the case of *Ceramium rubrum* which contained numerous uranium inclusions. These inclusions are represented by track clusters in the micromass (Fig.1) and range between  $10.5 \pm 1.6$  ppm and  $134 \pm 20$  ppm for *C. rubrum*. In *E. linza*, the uranium concentration varied between  $0.42 \pm 0.06$  ppm at Eforie South (1987) and  $0.13 \pm 0.02$  ppm at Mangalia (1990). For *C. barbata*, the uranium ranged from  $0.10 \pm 0.01$  ppm to  $0.18 \pm 0.03$  ppm.

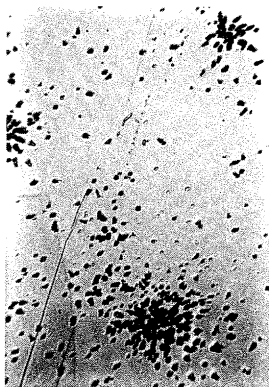


Fig. 1. Detail of U fission track micro-mapping in a *Ceramium rubrum* sample (x 900 magnification).

**REFERENCES**

1. DANIS A. & VOLJIN D., 1979.- Some considerations on the U content and distribution in marine rocks. *Nucl. Tracks*, 3: 83-84.
2. GEORGESCU I.I., PANTELICA A. & SALAGEAN M., 1990.- Radioactive contamination of the Romanian Black Sea Coast during 1989. *Rapp. Comm. int. Mer Médit.*, 31(1): 321.