Мета роботи — визначення оптимальних умов процесу флотоекстракції в системах з низькими концентраціями (10 мг/дм^3) іонів важких металів. Досліджено закономірності вилучення іонів Ni^{2+} та Fe^{3+} з модельних водних розчинів, які містять як один метал, так суміш двох металів. Методику проведення дослідів описано в роботі [1]. Використовували мила насичених кислот R-COOK в якості ПАР. Органічна фаза — ізоаміловий спирт. Об'єм органічної фази складає 5 см^3. Виявлено, що для всіх досліджених систем (Ni^{2+} : Fe^{3+}: $C_7H_{15}COOK$; Ni^{2+} : Fe^{3+}: $C_{11}H_{23}COOK$, Ni^{2+} : Fe^{3+}: $C_{18}H_{32}COOK$) процес слід проводити при співвідношенні Ме : ПАР = 1 : 2, pH 9. Тривалість проведення процесу складає 20 хвилин. Необхідно зазначити, що при сумісному вилучені металів їх максимальні ступені видалення є вищими ніж в системах з одним металом (так максимальний ступінь видалення іонів нікелю в системі Ni^{2+} : $C_7H_{15}COOK$ складає 82 %, а в системі Ni^{2+} : Fe^{3+} : $C_7H_{15}COOK$ — 89,7 %, ступінь видалення заліза: Fe^{3+} : $C_7H_{15}COOK$ — 74 %, а Ni^{2+} : Fe^{3+} : $C_7H_{15}COOK$ — 81,8 %). Максимальний ступінь вилучення металів при флотоекстракції суміші заліза та нікелю при pH 9 досягає Fe^{3+} — 94,6 %, Ni^{2+} — 99,0 % при використанні ПАР — пальмітату калію. Аналіз ІЧ-спектрів сублатів вказує на те, що Ni^{2+} знаходиться в сублаті у вигляді солі пальмітинової кислоти, а Fe^{3+} у вигляді гідратованого оксиду.

Досліджено вилучення іонів заліза (III) та нікелю із модельних розчинів. Виявлено раціональні умові проведення процесу та склад сублатів, що утворюються. Метод флотоекстракції має певні переваги и дозволяє вилучати важки метали з низькоконцентрованих розчинів.

Література:

1. Обушенко Т.І. Закономірності процесу флотоекстракції при очищенні стічних вод від іонів важких металів / Т.І.Обушенко, І.М. Астрелін, Н.М. Толстопалова, М.Є. Молодченко // Наукові вісті НТУУ «КПІ» . — 2009. — №3. — С.117–122.

UDC 543.544 543.062

NEW APPROACHES IN THE PREPARATION OF PROCESS SOLUTIONS FOR DETERMINING NATURAL RADIONUCLIDES AND TRITIUM

L. Bondareva

Siberian Federal University (Krasnoyarsk), Russia

660041, 79, pr. Svobodny, Krasnoayrsk, Russia,

e-mail: lydiabondareva@gmail.com

The aim has been to develop an express-method for preparing liquid samples with a complex matrix in order to determine natural radionuclides and tritium.

Drilling solution samples taken in one of Siberian oil deposits were used as the objects of study — 15 units. Use was also made of the ground waters with a considerable amount of mineral salts which had been taken in the Sakha Republic (Yakutia) — 10 units. In the latter case these were sulphate free Cl-Na-Ca brines effused from drilling holes, with the mineralization being higher than 100 g/L.

The initial solutions were subjected to conventional investigation techniques. The results were used for further comparison of the uranium and thorium contents obtained when using the approach being developed.

For this purpose, the liquid to be analyzed by the method of mass-spectrometry was decanted from a part of the initial sample.

As seen from the presented results, the samples contained considerable amounts of C, K, Na, Ca etc. Against the background of these elements, it was not possible to determine the uranium and

thorium content. The samples being analyzed were diluted 100, 1000 and 10000 times. The content of macroelements decreased to the same extent but uranium and thorium was not determined due to the concentration being considerably decreased, resulting from dilution.

To separate the liquid suitable for determining the content of tritium, uranium and thorium an installation for the liquid extraction was designed and a corresponding technique was developed.

The main principle of the technique is in extracting the azeotropic mixture with toluene, used earlier by the author to determine the tritium content in various environment objects.

When determining tritium in the extracted liquid the measurement efficiency amounted to 27 %. The measurement time was 720 sec. The results of the tritium determination are presented in Table 3. The minimum detected activity for tritium was 1 Bq/L.

Uranium and thorium in the obtained liquid were determined by the method of mass-spectrometry. The content of uranium-238, determined by the two methods are in good correlation and differ only within the measurement accuracy. However, the suggested sample preparation tech-nique is characterized by considerably decreased preparation time and, consequently, by signifi-cantly reduced analysis costs. The detection limit for uranium was 20 ng/L and thorium — 2 ng/L.

This scientific work is done with the partial financial support of the State contract № 3005 (2014–2016).

UDC 502.36:628.544:631.427.2(571.642)

THE SURVIVAL OF SOME AQUATIC ORGANISMS: *ELODEA CANADENSIS, LEMNA MINOR* IN A POLLUTED BY OIL AND PETROLEUM PRODUCTS

L. Bondareva[1, 2]**, K. Belugin**[1]
[1] *Siberian Federal University, Krasnoyarsk, Russia*
[2] *Permafrost Institute of the Siberian Branch of the Russian Academy of Sciences, Igarka, Russia*
660041, 79, pr. Svobodny, Krasnoayrsk, Russia
e-mail: lydiabondareva@gmail.com

In order to prevent significant health risks and the loss of biodiversity, and to prevent further contamination, enhanced remediation methods are necessary. Remediation can result in a speedy recovery of the environment from oil pollution. Therefore this study aimed at new, cost-efficient inventions for enhancing bioremediation and to increase the knowledge of oil remediation in water. Water for the mesocosms experiment was collected from an approximate depth of 1 meter from the Yenisei River, near the city of Krasnoyarsk. Aquatic plants (Elodea canadensis, Lemna Minor) were collected downstream from Krasnoyarsk in the Yenisei River. In systems were added different concentrations of crude oil (1–5 %). Using a Photon-10A fluorimeter the phytotoxic effect on living plants was studied immediately after removing them from the experimental systems.

Part of the oil evaporated from the water of the mesocosms. Water circulation was slow and therefore a thin oil layer remained on the surface during the experiment. Phytoplankton biomass was determined by chlorophyll a concentration. In general, the biomass of phytoplankton decreased in all basins (also in control treatments), apparently as a result of altered conditions, such as lower light intensity in the indoor mesocosm laboratory, compared to natural conditions in the Yenisei River. Biomass of the elodea increased in all basins for three weeks of the experiment, from 5 g to 8 g. Duckweed biomass also increased, and increased the number of leaves from each plant. We found that all the investigated species of aquatic plants died two days after the start of the experiment by using aqueous extracts of petroleum products (gasoline, diesel fuel, motor oil). Thus, it was