Artificial isotopes speciation in biomass of terrestrial vascular plants

M. KROPACHEVA[1*], M. MELGUNOV[1] AND I. MAKAROVA[1]

[1]Sovolev Institute of Geology and Mineralodgy SB RAS, Koptyuga Ave. 3, 630090, Novosibirsk, Russia (*correspondence: marya@igm.nsc.ru)

As a continuation of previous studies of artificial isotopes (^{137}Cs and ^{90}Sr) speciation in various components of the flood-plane biogeocoenose impacted by nuclear fuel cycle plants [1] we had to adapt the sequential elution technique (SET) [2]. Initially, this technique was developed as a tool for studying of atmospheric pollution by metals in mosses and lichens. Four fractions were extracted: I – intercellular (elements from the intercellular space and those connected with the outer side of the cell wall); II – intracellular (intracellular elements); III – contained elements, firmly bound in the cell wall and associated structures; IV – contained insoluble residue. Later, the technique was applied for studying of artificial and nature isotopes in aquatic plants [3, 4].

During the SET adaptation we used different reagents at the I (20 mM Na_2EDTA or 1M CH_3COONH_4) and II (1M HNO_3 or 0.1M HCl) stages, and various time for the I stage (24-120 h). Adaptation accuracy was monitored with the ^{40}K isotope distribution [5]. The most adequate version of SET is the version using 20 mM Na_2EDTA at the stage I. Here are several of its advantages: minimization of error at change in time the stage I; crystal sediment does not precipitate during solutions evaporation for γ-spectroscopic measurement (this process greatly complicates the measurements on the coaxial Ge(Li) semiconductor detector). Separation of fractions III and IV can be neglected, since the output of isotopes into the IV fraction is at the level of error detection.

Distribution of ^{137}Cs and ^{90}Sr isotopes in the terrestrial vascular plants biomass significantly depends on the plant's age. Young plants concentrate isotopes in the extracellular (up to 35 %) and intracellular (up to 60 %) fractions. In mature plants isotopes are fixed mostly in the cell wall structures (up to 80 %).

The work was partly supported by RFBR Grant 18-05-00953 and the state assignment project 0330-2016-0011.

[1] Kropacheva *et al.* (2014) *Goldschmidt2014 Abs.* 1325. [2] Vázquez *et al.* (2000) *Water Air Soil Poll.* **120**, 1-19. [3] Bolsunovsky (2011) *Env. Sci. & Tech.* **45**, 7143-7150. [4] Zotina *et al.* (2008) *Dokl. Biol. Sci.* **421**, 254-256. [5] Kropacheva *et al.* (2017) *J. Environ. Radioactiv.* **167**, 180-187.