**Study of isotope ratios of the Chernobyl origin
and explosive origin hot particles**

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Various origin radioactive particles were studied: “Chernobyl” hot particles, sampled in the “Red Forest” soils at the Chernobyl Exclusion zone, and “explosive” hot particles, sampled at the experimental field of the Semipalatinsk Test Site.

The radionuclide compositions of sampled hot particles were obtained by HPGe spectrometers and radiochemical methods. The maximum activity of investigated Chernobyl origin hot particles was 103 Bq/sample (by 137Cs). The maximum activity of investigated explosive origin hot particles was 104 Bq/sample (by 239Pu).

Currently, radioactive particles of several varieties are found in the soils of the near the 4th Chernobyl NPP unit. The first type is characterized by the dominant 137Cs and 90Sr activities. The contribution of plutonium and 241Am isotopes varies between 4-10% compared to 137Cs activity in such hot particles. We can note the 90Sr/137Cs ratio currently is 3-4 in these hot particles, while it was 0.7-1 for the majority of hot particles sampled in the 2000s at the same places.

After the building of the Chernobyl’s New Safe Confinement, hot particles of a new type were found in the surrounding areas. They also contain dominant activities of 137Cs and 90Sr, however, the 241Am contribution reaches to 20%. In addition, the 60Co significant amount and the 94Nb activity with a half-life of 2×104 years were found in such particles. This fact indicates the secondary contamination of the 4th Chernobyl NPP unit surrounding area with fragments of structural materials during the new confinement building.

Also, Chernobyl hot particles of a completely new composition were studied for the first time. In these particles, the 241Am activity is 5-6 times more than the 137Cs activity. The activity of other gamma nuclides is the same as in hot particles of the first type.

Studies of the dispersed composition of Chernobyl hot particles in soil were carried out by the radiographic method. We obtained that the size maximum distribution of hot particles has shifted by 1-1.5 microns compared with the distribution in the 2000s. It can be concluded that there are intensive processes of destruction of hot particles in the soils of the Chernobyl exclusion zone.

The elemental and radionuclide composition of Semipalatinsk hot particles was studied. The explosive hot particles were sampled at the P-1 technical place of the Semipalatinsk Test Site (the place of 1949-1953 two atomic and one thermonuclear explosions). These particles are characterized by the dominant 239Pu activity. The 239Pu activity was reliably detected in the gamma spectra of all these particles.

The isotope ratios of the accident origin and explosive origin hot particles were calculated. The obtained results are discussed.

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