

Radiochemical contamination of the environment around phosphogypsum stockpile in Wiślinka near Gdańsk (northern Poland).

Grzegorz Olszewski 1, 2, Alicja Boryło 1, Bogdan Skwarzec 1

1. University of Gdańsk, Faculty of Chemistry, Department of Chemistry and Environmental Radiochemistry, Laboratory of Analytical and Environmental Radiochemistry, Wita Stwosza, 63, 80-308, Gdańsk, Poland.
2. Swedish Radiation Safety Authority, Solna Strandväg 96, 171 54 Solna, Sweden

The phosphogypsum stockpile in Wiślinka (northern Poland) was closed in 2010 and covered with sewage sludge in order to immobilize phosphogypsum. Even though there is still high probability that stockpile could be extremely important from the environmental point of view. Sixteen million tons of stored phosphogypsum is located between Dead Vistula (Martwa Wisła) river and crop fields. The aim of this research was to analyze the concentration activities of radionuclides ^{210}Po , ^{210}Pb , ^{234}U , ^{235}U , ^{238}U in samples of water, surface soils and common nettle (*Urtica dioica*) collected at the area of phosphogypsum stockpile and then to determine the degree of radiochemical contamination in individual components of the environment. Additionally, the values of $^{210}\text{Po}/^{210}\text{Pb}$, $^{234}\text{U}/^{238}\text{U}$ and $^{235}\text{U}/^{238}\text{U}$ activity ratios were calculated what helped to identify the sources of these radioisotopes. In the analyzed plants the bioconcentration (BCF) and translocation factors (TF) were calculated for specified radionuclides. The results for surface soils were analyzed statistically what allowed separating the samples with similar activity concentrations of ^{210}Po , ^{210}Pb , ^{234}U , ^{235}U , ^{238}U . Using natural neighbor interpolation method we developed dispersion maps for ^{210}Po , ^{210}Pb , ^{234}U , ^{235}U and ^{238}U concentrations around phosphogypsum stockpile. This allowed defining radiological contamination zones around the stack in Wiślinka. In addition, we checked the possibility of using common nettle (*Urtica dioica*) as a bioindicator of environmental contamination with polonium ^{210}Po , ^{210}Pb lead and uranium ^{234}U and ^{238}U .

The authors would like to thank National Science Centre Poland and Polish Ministry of Science and Higher Education for the financial support under grants UMO/2012/05/N/NZ7/00978 and DS/8630-D505-14.