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CHARACTERISTIC OF THE STATE OF TECHNOGENIC CHANGED SOILS OF RESIDENTIAL TOWNSHIP

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The results of a comprehensive observation of the soils of a residential township during 2001-2013 are presented. Soil samples taken from the area adjacent to the enterprise which is engaged in the investigation and development of materials for nuclear power engineering (color of territory NSC KIPT is black) (Fig.1). The aim of the work is to determine the extent of changes in the content of chemical elements in the soils which is exposed to anthropogenic factors and to receive their distribution in the depth. Analysis of the samples was carried out using nuclear-physical methods of analysis (NPMA) of beams of accelerated ions (a technique proton induced X-ray emission (PIXE) ($Z=14-82$) and proton induced gamma-ray emission (PIGE) ($Z=3-13$)) at the nuclear complex «Sokol» developed in NSC KIPT in 1989. Fig.2 shows a typical X-ray spectrum emitted from the soil sample №18 taken with PIXE for $Z=13-40$. The assessment of the ecological status of soils was carried out using coefficient of danger of chemical substances and total contamination index. For the study area maximum coefficients was obtained for Cr, Ni, Cu, Zn, Zr, Pb. For them, we calculated the total contamination index (Fig.3). The results of the last year of observation for the different zones of influence of anthropogenic factors are given in Table.1. In soil profile it was observed accumulation of heavy metals regardless of their number in the near-surface layers (Table 2). Beginning with the 21st century in the studied soils we observed increase in content of heavy metals (Cu, Zn, Cr, Co, Ni, Pb, Zr). In recent years, this is caused by the increased movement of vehicles. At points along the road received the minimum number of essential elements (Na, Mg, K, Ca, Ti, Fe, Li, F, Br, Rb). For a comprehensive description of the ecological status of contaminated soils requires the identification of all chemical elements of the soil. Using nuclear-physical methods of analysis of beams of accelerated ions (PIXE and PIGE) allows solving these problems.

Key words: *soil monitoring; quantitative analysis; chemical elements; nuclear-physical methods of analysis (NPMA) of beams of accelerated ions.*

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ХАРАКТЕРИСТИКА СОСТОЯНИЯ ТЕХНОГЕННО ИЗМЕНЕННЫХ ПОЧВ ЖИЛОГО ПОСЕЛКА

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Приведены результаты комплексного обследования почвенного покрова жилого поселка, прилегающего к территории предприятия, за период 2001-2013 годов. Установлено, что для характеристики ухудшения состояния почв необходимо учитывать как накопление техногенных загрязнителей, так и уменьшение количества жизненно важных элементов. Оценена степень опасности загрязнения почв данного населенного пункта комплексом металлов. Продемонстрированы преимущества использования ядерно-физических методов анализа (ЯФМА) на пучках ускоренных ионов для одновременного определения содержания химических элементов с $Z=3-82$ в почвенном покрове.

Ключевые слова: мониторинг почв; количественный анализ; химические элементы; ядерно-физические методы анализа (ЯФМА) на ускоренных ионах.