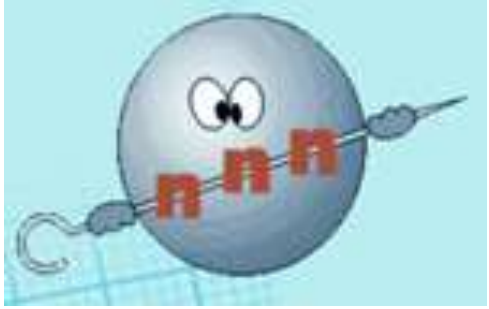
23-rd International Seminar on Interaction of Neutrons with Nuclei



FIRST ATTEMPT TO USE MOSS AS BIOMONITOR OF AIR POLLUTION IN KAZAKHSTAN

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QUADRIPARTITE AGREEMENT

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МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ ПРИРОДЫ, ОБЩЕСТВА И ЧЕЛОВЕКА
"ДУБНА"

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INTRODUCTION

The International Cooperative Programme on the effects of air pollution on natural vegetation and crops was established to consider the underlying science for quantifying damage to plants by air pollutants. Scientists from more than 40 countries currently participate in the ICP Vegetation. The programme is led by the UK and coordinated by the Centre for Ecology and Hydrology in Bangor.

Cleaning of moss

Drying moss at room temperature

Mosses as biomonitors of atmospheric deposition of heavy metals

Increased and excessive accumulation of heavy metals in the soil, ground water and organisms can cause retarded growth of trees and crops and increased levels of heavy metals in the food chain leading to man.

One of the main benefits to be gained from studying heavy-metal fallout through moss analysis is that metals are accumulated by the moss, leading to much higher concentrations than in air, rain and snow. The problems of contamination during sampling and analysis are therefore relatively small, and sampling can be carried out using relatively simple methods.

THE PURPOSE OF THE PROJECT

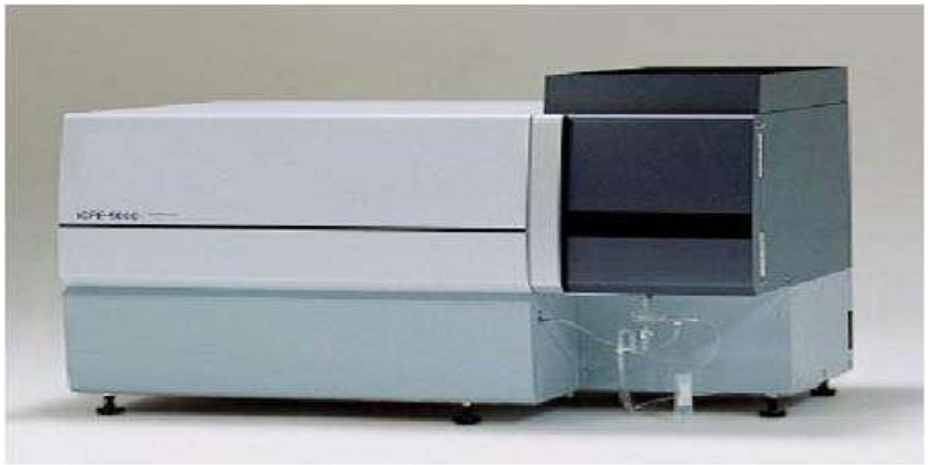
The method of moss biomonitoring of atmospheric deposition of trace elements was applied for the first time in the Almaty region to assess the environmental situation in this region.

THE TWENTY THREE MOSS SAMPLES HAVE BEEN COLLECTED IN 2014 SUMMER GROWTH PERIOD.

THE METHODOLOGY OF WORK

An analysis of the elemental composition of samples carried out using the method of reactor instrumental neutron activation analysis (INAA). INAA is hold at the pulsed fast reactor IBR-2 at the Laboratory of Neutron Physics named I.M. Frank. This method allows to determine the concentration of more than 30 elements.

Though, ecologically important element - lead - can not be determined by neutron activation analysis, at low concentrations in the samples are also difficult determination of mercury and copper, and therefore to determine these elements will be used ICPE-9000 and AAS in the future.



SAMPLING SITES

THE RECEIVING EXPERIMENTAL DATA

- Concentrations of Na, Mg, Al, Cl, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Ni, Co, Zn, As, Se, Br, Rb, Sr, Zr, Nb, Mo, Ag, Cd, Sb, Ba, La, Ce, Nd, Sm, Eu, Gd, Tb, Dy, Tm, Tb, Hf, Ta, W, Au, Th, and U determined by neutron activation analysis in the moss samples are reported. Multivariate statistical analysis of the results obtained was used to assess the pollution sources in the study area of the Almaty region. Three factors were revealed. Factor 2 (Ti, Mn, Mo, Hf, U and Lantanides) is associated with the sampling sites 11 – Karasay district, sampling site 17 – Zhambyl district and 23 – Talgar distrtict. Zn, Au and Sb (factor 3) characterizes the settlement Talgar (sampling sites 18, 19, 23). Further investigations in the framework of the UNECE ICP Vegetation programme will provide information of air pollution in Kazakhstan.

THE PROJECT IS EXPECTED TO RECEIVE THE FOLLOWING RESULTS:

- The receiving experimental data characterizing the atmospheric deposition of polluting elements in the territory of Almaty region (East Kazakhstan region);
- There will be maps of the spatial distribution of elements and radionuclides in the study area;
- Based on the statistical analysis of the data created with the use of maps of the distribution of elements, will assess potential sources of pollutants into the environment.

Thank you for your attention