Chemical Pollutants – Eco-toxicants in the Environment of the

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Introduction

The solution of any geo-ecological problem requires some information about the prevalence and the type of availability of chemical elements and compounds in the main natural and anthropogenic media, which are: atmosphere, soil, watershed, social and industrial discharges, plants and animals.

None of the ecological factors being environmentally indifferent, their effect is specified by the geochemical characteristics as well as by concentrations and levels in geospheres.

The UN list as the most harmful for the human being the following substances (eco-toxicants): heavy metals, polyaromatic hydrocarbons (PAH) and their nitro-derivatives, N-nitrozoamines and some others. Many of them are abundant in geospheres, showing a great variety of physical, chemical and eco-geochemical properties and also being mutagenic, carcinogenic and teratogenic.

The purpose and object investigation.

The main purpose of the work was to carry out a complex investigation of the geospheres at the sites of underground gas storage (UGS) objects with the view of defining the impact of industrial discharges on the environmental chemical composition.

The work was carried out at the Russian largest UGS - the Kasimovskoe and Uvjazovskoe of the Rjazan region. The present ecological state of the UGS causes great international concern, which fact influences the volume of the "GAZPROM" exported gas supplies.

The main sources of pollutant emissions at the UGS arise from the maintenance of the fuel consumption facilities, such as gas pumping units, boiler units, as well as from transport vehicles.

Methods of investigation.

The snow cover was studied to define macro- and microelement concentrations, PAH, mineralization etc,

The soil was studied to define nitrogen oxides (NO, NO_2), carbon oxides (CO, CO_2), methane, PAH and benz (a)pyrene.

The methods used in the above mentioned studies included up-to-date methods of chemical analysis such as chromato-mass-spectrometry, GC, UK-spectroscopy, spectral luminescence and some others.

Results and discussion.
Snow cover chemical pollutants.

The data analysis of the ecologically harmful chemical compounds shows different degree of the pollution. The results of the snow acido-alkaline potential at all sites investigated are 4.7 - 5.6, these figures being negative for the atmospheric precipitations. This may be the result of either acid rains, such as CO_2, SO_2 and others, or presence of residual products after natural gas burning.

The results of the spectral analysis give 49 elements with the highly changeable concentrations. However no dangerous microelement concentrations including heavy metals were found.

BP concentration in the samples varied within 20-141 ng/l. There were 18 priority compounds in PAH, the most concentrated being 3-4 benzene rings PAH such as phenanthrene, pyrene, phenanthrene. The greatest carcinogenic activity was shown by dibenzo(a,h)pyrene, dibenzo(r,s,t)pyrene alongside with BP. However, light compounds causing no tumorogenic activity were prevailing.

Soil chemical pollutants.

BP concentration at the level of 1 mkg/kg was found in the majority of soil samples (maximal permissible concentration /MPC/ - 20 mkg/kg).

N-nitrozoamines have no MPC in the soil. The study of volatile nitrozoamines gives the following: N-nitrozodimethylamine - 4,7 ; N-nitrozodiethylamine - 2,3; N-nitrozodibutylamine - 1,1 mkg/kg.

Mineralization (desalinated soils up to 3000 mg/kg) has the total number of salts in the samples investigated of 160-1800 mg/kg which is the evidence of a low level of salt availability.

Sodium chloride concentration is not high, within 6-1460 mg/kg in the majority of samples.

Nitrate and sulphate with MPC 130 and 160 mg/kg in the soil were found within normative in the majority of samples.

PH of the water extraction from the soil is neutral.

Atmospheric chemical pollutants.

The chemical structure of the atmospheric air samples was studied to define their subjection to mainly UGS facility discharges, taking no account of vehicle discharges.

Having studied the pollutants concentration in the atmospheric breath layer we found no MPC above the permissible level for NO_x, CO, CH_4, BP.

Conclusion.

The comprehensive studies of eco-toxicants in geospheres have shown a low level of pollution as compared to MPC. Only in a small number of samples studied the permissible level was exceeded both for standards and other criteria of environmental assesses.

The assesses of the gas industrial units enable us to predict that in the future natural gas is going to play the leading role in the national power industry, being the most optimal, cheap and rather harmful for a human being