Waste Boring Solutions and Slimes Detoxication by Humic-Mineral Concentrate for their Use to the Improvement of Disturbed Lands

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Growth of oil – gas – industry is accompanied by the increase of anthropogenic loads on the environment. The technogenic pollution of naturunits with the boring wastes, generated by process of boreholes building and operation, is the main factor of oil-gas-minig-process.

Waste boring solutions and slimes contain fine particles of outboring rocks and technologic stipulated clay components, that could be used for the properties reclamation of sandy and loamy-sandy soils. But boring wastes contain also a wide range of pollutants (boring practice chemicals) and toxicants, going from boring rocks and bed-waters (soluble salts, including soda, heavy metal ions, liquid hydrocarbons).

New technologic for detoxication toxic water clay waste boring solutions and slimes by humic-mineral concentrate (TY – 2189-004-52388344-00) with their subsequent use as means of reclamation for the improvement of disturbed lands is developed by OOO «Novaja Ecologia».

The greatest effect could be expected from the application of that means to coarse textured soils. Sandige grounds and soils formed on sands have any negative properties because of absence or lack of fine fractions. As a rule they are poor of organic matter, especially of stable humic acids, have a low fertility and need to be improved. That soils with low exchange and small buffer capacity, poor structure bad waterholding and low nutrient reserves gain positive properties after clay minerals come in with the reclamation mean.

The aim of the work is investigation of the impacts this humic-mineral concentrate on plants and soil properties and study its potential for the improvement of disturbed soils.

Materials about transformation of properties of coarse textured soils from Orenburg- and Astrakhan-regions after the humic-mineral concentrate application would be submitted. The change of physical soil properties (full and minimum moisture-holding capacity, structure component of the soil), of plant productivity and ensyme activity are also assessed.

Ozone Application for Modification of Humates and Lignins

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The synthesis of new and environmentally benign complexing agents to heavy metal ions attracts a great interest. Natural materials, such as humic substances (HS) and their precursors (e. g. lignins) are promising objects for this purpose, since they exhibit a little or no toxicity and significant binding and detoxifying potential in relation to heavy metals. One of the ways to improve the complexing ability is to increase the content of oxygen-

containing functional groups. In this context the application of ozone is expected to be both effective for the oxidation of the natural materials and for the avoidance of toxic byproducts.

Lignin (LG) and potassium humate (H) were ozonized in water solutions at pH range from 1,0 to 12,5. Ozonation was carried out in a bubble reactor. To control the kinetics of the reaction both inlet and outlet ozone concentrations were registered. To analyze products of LG ozonation UV-, NMR-spectroscopy methods were used.

The new kinetic approach was developed to investigate the ozonation in a bubble reactor. It makes possible to distinguish different reaction mechanisms. Multistage reactions could be investigated using this approach, and the rate constants of intermediates interaction with ozone could be also calculated.

Kinetics, NMR-, and UV-spectra analysis proved the principal stages of ozonation of such substances as LG and H. At first, aromatic rings are oxidized forming unsaturated compounds, further they transform into aliphatic structures. Carboxylic groups growth is observed in the course of LG ozonation. At that, in basic solution the quantity of carboxylic groups is more significant.

Data obtained allow to regulate lignins and humates oxidation by ozone by pH variation. The results make possible to find out the most favorable conditions to produce compounds promising as complexing agents.

Role of Humic Substances in Complexation and Detoxification Processes (taking the Dnieper reservoirs as example)

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Dissolved organic matter (DOM) are considered to play the main role in the complexation and detoxification of heavy metals in natural water. Humic substances (HS), chiefly fulvic acids, are the predominant component of the organic matter in the Dnieper reservoirs. Their content in total DOM is reached 70-90% in Kiev, 55-68% in Kremenchug and 45-60% in Kakhovka reservoirs. The concentration of fulvic acids (FA) is 20 to 40 times higher than that of humic acids (HA). In the successive reservoirs the concentration of HS fell. HS are chiefly the allochtonous organic substances and brought into reservoirs with surface water. Maximum content of HS is usually observed in spring, owing to the high-water period. The concentration of HS gradually declined through the summer, autumn and winter. Data on the molecular weight distribution of FA showed that the low molecular weight substances predominate (below 1000 Da). At the same time molecular weight of this substances depends on the cascade arrangement of the reservoirs. The content of FA with molecular weight more than 1000 Da are 35% in Kiev, 24% in Kremenchug and 20% in Kakhovka reservoirs. The more deep transformation of FA to the low molecular weight