

MT-05

THE ROLE OF SOIL PROPERTIES ON THE TRANSFORMATION AND FATE OF NANO-ENABLED AGROCHEMICALS IN THE SOIL SYSTEM

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There is an increasing interest on the application of nanotechnology to develop plant protection products aiming sustainable food stocks worldwide. For example, silver nanoparticles (AgNPs) have been exploited as a fungicide or inhibitor of plant pathogens. However there are still major unknowns related to the effect of soil properties on their efficacy during field applications and also on the fate and effects of NPs added to soils.

Following the entry of manufactured nanomaterials (MNMs) in the terrestrial ecosystem, a number of potential transformations may occur depending on the properties of the MNMs and of the receiving medium. These transformations largely involve chemical and physical processes that will control their fate, behaviour, and ecotoxicity in soil as well as availability for sensitive receptors including plants, animals and human health.

In this presentation we discuss the transformation processes, mobility and potential availability for sensitive receptors of metal-based MNMs in agricultural soils in view of MNMs nano-specific properties and in view of observed effects of key soil properties on MNMs' stability in pore water (notably pH, ionic strength, organic matter, and natural inorganic colloids). Key aspects of this discussion are the role of aggregation in the retention of MNMs in the solid matrix, the increased stability of MNMs in soil solution due to binding of molecules from dissolved organic matter (DOM) and the understanding of the effect of DOM in relation to soil chemistry and to surface characteristics of MNMs. We also discuss whether classical theories of colloid stability and transport modelling can grasp the complexity of structural and chemical transformations of MNMs in soils and to fully account for the impact of soil geochemistry.

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MT-06

THE SPATIOTEMPORAL ANALYSIS OF THERMAL COMFORT AND PUBLIC HEALTH IN URBAN CENTERS OF RUSSIA

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It is obvious that environmental factors such as climate influence on public health. For example, health effects can be seen due to climate change days when waves of heat or cold are observed became more frequent. The good option to assess the impact of the climate change on public health is to evaluate the bioclimatic comfort in the cities where the specific microclimate conditions are formed.

The global experience shows more than 100 indexes that have been developed to determine the bioclimatic comfort of human. Three indexes were selected as the most commonly used in the world for the analysis of extreme events: two of them are thermal index – Heat Index and Humidex and one index of cold stress – Wind Chill Temperature. The study includes 115 cities in Russia with population over 100 000 people. For the calculation of the indexes it was used daily meteorological data (2010-2014) of climatological stations located in urban centers.

Technical implementation of the calculation of the indexes is presented in the form of an automated system based on MSVisualFoxPro. It has been created the specialized software module that downloads weather data, verifies and selects the correct values and then calculates and builds up bioclimatic indexes in tabular and graphical form.

The software allows to carry out bioclimatic indexes for each day of the year for each city as well as to display summary information for months with the total amount and proportion of days with a certain gradation indexes. Based on this study it's analyzed the thermal comfort in different cities of Russia. Changes in the frequency of extreme temperature in the daytime and nighttime were examined and conclusions about the possible health effects of the population, including changes in mortality from cardiovascular disease, were made.

MT-07

MICROORGANISMS ISOLATED FROM PERMAFROST AS FACILITIES FOR THE DEVELOPMENT OF NEW DRUGS

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It is shown on the various models that drugs derived from the bacteria isolated from permafrost have reparative and protective properties for the treatment of injuries of the experimental animals.

Earth Cryosphere can be a source of unique biological resources, which include microorganisms. Bacteria isolated from permafrost for a long time preserve their vitality in extreme ambient conditions in a state of suspended animation or hypometabolism. It is known that soil microorganisms capable of synthesizing a very large number of various biologically active substances including antibiotics, cytokinins, gibberellins, hormone-like substances. It is expected that the bacteria from the permafrost can produce specific biologically active substances that can affect the physiological and biochemical parameters of animals.

The results of research. We used strains of bacteria of the genus *Bacillus*, selected by us from permafrost of Western and Eastern Siberia and identified by sequencing for 16S RNA. The strains were deposited at the RCIM FGUPGosNIIGenetika.

We carried out experiments on the effect of these metabolites: to repair skin wounds of the mice; to repair experimental mechanical erosion of the corneal epithelium of rabbit's eye and on the outcome of closed brain neurotrauma of experimental rats to study the protective and reparative properties of the metabolites, derived from microorganisms. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19.06.03 "Rules of good laboratory practice in the Russian Federation" of humane treatment of laboratory animals were observed in all experiments.

When studying the skin wound repair rate in mice under the influence of the metabolites derived from bacteria, wound healing of the mice was 18.2% faster than that under the influence of placebo and of 9.1% faster than under the action of the drug "Solkoseril".

The study of the efficacy of treatment of experimental erosion cornea of an eye of rabbits with a preparation containing metabolites of the bacteria strain *Bacillus* sp. showed that a full recovery after experimental injury of the cornea occurs in 2,5 times faster than in the treatment of drug "Solkoseril".

It was shown that the complex of strain *Bacillus* sp metabolites in experimental closed brain neurotrauma has a marked protective effect. Mortality of animals in the experimental group was 10 times lower than in the control and reference groups.

The findings suggest that the development of pharmaceuticals based on metabolites of bacteria strains isolated from permafrost may be perspective.

MT-08

MINERALOGICAL, GEOCHEMICAL AND TECHNOLOGICAL CHARACTERIZATION OF CLAYEY COMMERCIAL COSMETIC PRODUCTS

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Clay minerals are used in cosmetics mainly as adsorbents, opacifiers and viscosity-increasing agents. Few studies were performed to study the technological properties that clays should possess to be included in cosmetic products. Important properties such as specific surface, cation exchange capacity and physical structure enables the adsorption of greases and toxins; abrasivity, cooling kinetics and plasticity are very important to the effectiveness and pleasant sensation of the cosmetic application onto the skin. The present study aims: 1) the physical, chemical and mineralogical characterization of some clayey commercial products available on market; 2) to contribute for the establishment of chemical, physical and mineralogical criteria for clays used in cosmetic products. 20 commercial products were selected, having the following product indications: healing, cleanse, absorbent, refreshing, calming, congestion-reducing, energizing. Several analyses were carried out: grain size distribution (wet sewing and sedimentation), mineralogical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasivity, plasticity, cation exchange capacity and exchangeable cations, specific surface area, expandability, oil absorption and cooling rate. The results obtained so far show that almost all samples have high contents of fine fraction and are mainly siliciclastic (a few carbonated), having kaolinite or illite as main clay minerals, being smectite a minor component; in general, samples present a chemical composition compatible with the desired applications, Ca being the main exchangeable cation, followed by Mg or Na. Regarding technological properties, samples more siliciclastic and richer in clay minerals revealed lower abrasivity, higher expandability and cooling kinetics.

MT-09

PROSPECTS OF APPLICATION OF GEOINFORMATIONAL SYSTEMS FOR VETERINARY GEOLOGY

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Every organism is constantly exposed to biotic and abiotic environmental factors. Geological objects (soil, minerals, water, etc.) and factors play a great role for large group of animal diseases, listed as endemic (endemic osteodystrophy, enzootic ataxia sheep, sheep boris enteritis, white muscle disease and lack of microelements). The causative factors are geochemical and a chemical composition of soil and water of different geochemical zones. These factors affect the development of pathological processes. As a result Veterinary Geology as a new branch of veterinary medicine is being formed.

Veterinary Geology is a branch of Veterinary Medicine, which studies the influence of natural and anthropogenic geological objects and processes on animal health and quality of