# V$^{th}$ INTERNATIONAL CONFERENCE "ACTUAL SCIENTIFIC & TECHNICAL ISSUES OF CHEMICAL SAFETY" ASTICS-2020

# BOOK of ABSTRACTS

**October 6 - 8 , 2020**
**Kazan**

*Ministry of Science and Higher Education of the Russian Federation;*
*Ministry of Industry and Trade of the Russian Federation;*
*N.N. Semenov Federal Research Center for Chemical Physics, Russian Academy of Sciences;*
*Federal State Unitary Enterprise "State Research Institute of Organic Chemistry and Technology";*
*Federal Research Center "Kazan Scientific Center of the Russian Academy of Sciences";*
*A.E. Arbuzov Institute of Organic and Physical Chemistry — Subdivision of FRC Kazan SC of RAS*
*N.N. Vorozhtsov Novosibirsk Institute of Organic Chemistry SB RAS*
*Semenov International Center of Chemical Physics*

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Book of Conference Abstracts includes Conference Program and summaries of scientific research results and activities in the field of fundamental and interdisciplinary research of chemical safety issues and protection of human health and environment from exposure to hazardous chemical factors.
The topical issues are:

- Chemical hazard sources. Toxic chemicals, including persistent organic pollutants, pesticides, emergency and hazardous chemical substances.
- Methods and tools for indication and identification of hazardous chemicals and mixtures thereof in environmental objects. Monitoring soil, air, and water status.
- Green technologies.
- Hazardous chemical facilities. Technologies for elimination of chemical hazards. Chemical hazard assessment and risk modeling. Chemical accident/incident prevention.
- Technologies, procedures and means for creating materials aimed at technical protection, prevention and remediation of chemical contamination consequences. Impact of hazardous chemicals on human health.
- Waste management. Utilization and biodegradation of hazardous wastes.
- General information on chemical safety.

The book contains abstracts of authors from Azerbaijan, Belarus, Kyrgyzstan, Latvia, Republic of Moldova, Russia, Tajikistan, Uzbekistan, and Ukraine.

For researchers and experts dealing with chemical safety, ecology, and environmental protection.

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## V$^{th}$ International Conference
## Actual Scientific & Technical Issues of Chemical Safety (ASTICS-2020)

Notably, 2020 is the year of completion of the activities performed during the course of the federal target program "National System of Chemical and Biological Safety of the Russian Federation" (hereinafter – Program). The Program was carried out in 2 steps with the main activities conducted in the period 2009–2014, followed by the second step during 2015–2020. Ministry of Industry and Trade of the Russian Federation was the customer and coordinator of almost all the activities aimed on ensuring chemical safety. Russian Academy of Sciences and Semenov Federal Research Center for Chemical Physics stood at the origins of the development of the Concept of the Program and took an active part in its formation and implementation.

A good tradition has arisen to discuss the results of the implementation of the Program activities at conferences under the general title "Actual Scientific and Technical Issues of Chemical Safety". In our opinion, and according to the participants and guests of the previous conferences, the topics of the discussed reports were extremely relevant. Practically all research and engineering problems in the field of creating a national system of chemical safety were considered, and the solutions of certain conceptual issues were proposed including the applied matters. Based on the materials of the conferences, in total 10 special issues were published of the journals: Russian Chemical Journal, Chemical and Biological Safety, Russian Journal of Physical Chemistry B and Chemical Safety Science.

In August 2019, the Government of the Russian Federation approved the Action Plan for the implementation of the Fundamentals of State Policy of the Russian Federation in the field of chemical and biological safety for the period up to 2025 and beyond. The plan entails the development and approval of the State Program "Ensuring Chemical and Biological Safety of the Russian Federation" in 2020.

**The main task of the State Program is to stabilize the state of chemical and biological safety, to ensure an acceptable level of chemical and biological risk.** The main elements of the state program will be grouped in priority areas of state policy in the related area and divided into the appropriate subprograms:

– monitoring of chemical and biological risks;
– development of public administration and resource provision of the national system of chemical and biological safety;
– neutralization of chemical and biological threats, prevention and minimization of risks.

These areas should become the basis for the related activities of all research and field-specific organizations in the near future.

As always, following the results of our conference, at the end of the year we will prepare a special issue of Chemical Safety Journal.

Dear colleagues, we wish you every success at the conference and in your daily scientific research!

Organizing Committee

## CONTENTS

# Indentification of atmospsheric nitrogen pollution impact on forest ecosystems: case study of the Udmurt Republic

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Over the past 250 years, the global production of reactive nitrogen (N) has increased by 200%, with industry and motor vehicles as the main sources [1]. Anthropogenic nitrogen is actively involved in natural biogeochemical cycles, which leads to increased depositing of N in natural ecosystems. However, due to the multiple role of nitrogen (nutrient and acid element), it is often methodologically difficult to evaluate the environmental impact of its atmospheric deposition.

According to the State Report "On the State and Environmental Protection of the Udmurt Republic (UR)", emissions of nitrogen oxides ($NO_x$) from total sources increase annually and in 2016 amounted to 17.2 thousand tons [2]. Woody vegetation 'absorbs' 2–3 times more pollutants from the atmosphere than herbaceous and bushy vegetation. With a 37% forest cover in Izhevsk, this region is a good target for studying the impact of anthropogenic nitrogen deposition on terrestrial ecosystems.

Coniferous and deciduous forests were studied in the Umbric Albeluvisol in Izhevsk and Zavialovsky district. In key areas (n = 21), sites (10 $m^2$) were selected where snow cores in March reached snow cover thickness ('envelope method'). The soil samples were taken in August (mixed sample in 5 replicates, humus horizon 0–20 cm, without plant litter). A geobotanical description of the vegetation was also carried out. To characterize the presence/absence of species – indicators of soil availability $N_{min}$, the G. Ellenberg ecological scale was used. The content of mineral nitrogen ($N_{min}$) was determined in soil and snow, including its ammonium ($NH_4$) and nitrate ($NO_3$) forms. In the soil, total carbon (C) and nitrogen (N) were additionally measured (dry combustion method with Elementar Vario EL III analyzer) and $P_2O_5$ (X-ray fluorescence method). The C/N ratios in the soil were calculated, which reflected the rate of mineralization of organic matter. The relationship between $N_{min}$ atmospheric deposition, soil properties and ground cover structure was evaluated by Spearman's correlation analysis.

It was found that the total $N_{min}$ deposition in the region under study ranged from 0.15 to 20.6 kg N $ha^{-1}$ $year^{-1}$ (Fig. 1) with the highest values noted in the center (Izhevsk industrial region), with the ammonium form prevailed in the chemical composition. The increase in ammonia content in atmospheric

deposition in forest areas may be the result of increased emissions from fires or the decomposition of large amounts of biomass. In the central and eastern parts of the city, the soil content of C, N was higher and their ratio was lower, but no correlation relationship with the $N_{min}$ deposition was found for these indicators.

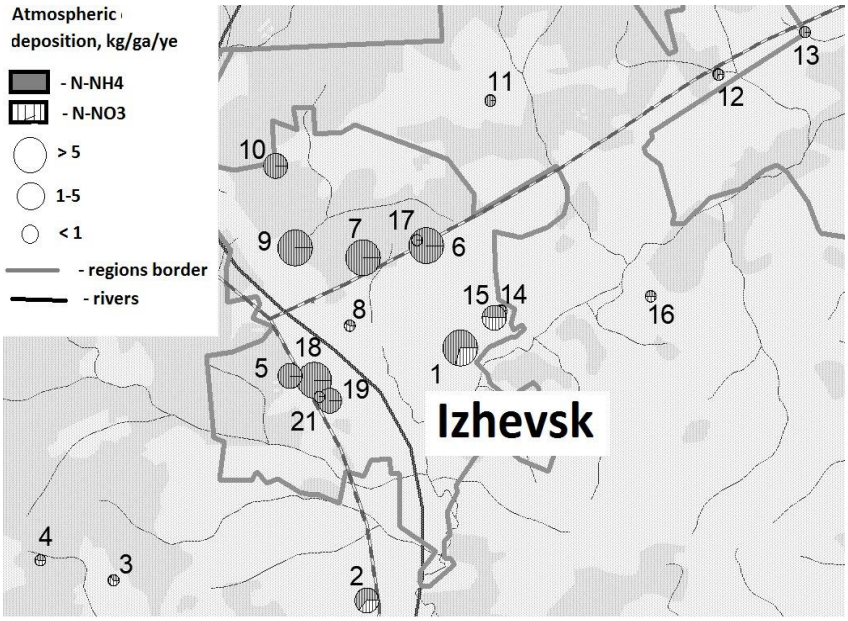


***Fig. 1.*** Atmospheric $N_{min}$ deposition (the sum of $N–NH_4$ and $N–NO_3$) in the forests of the key studied areas

Areas with a higher level of $N_{min}$ deposition were found to have a higher $N–NO_3$ and $P–P_2O_5$ levels in soil ($p^2 = 0.5–0.7$), which indicates a change in the nutritional status towards eutrophication. The change in substrate nutritional status indicates a sharp growth of plant species that prefer nitrogen-rich soils (nitrophils). This fact was confirmed by our study, when we identified nitrogen-rich habitats in the studied areas, where plants are oligotrophs, occurring as an exception (score on the G. Ellenberg scale of 7), and are characterized by the highest $N_{min}$ deposition levels. In addition, in the study area, $N_{min}$ concentrations in precipitation were found to be higher than the critical values for oligotrophic and mesotrophic soil cover types in three ranges, and in 11 ranges these values were close to those critical for coniferous species indicating a risk of extinction of these species while maintaining or increasing the current levels of $N_{min}$ deposition.

*The work was performed as part of the state task No. 0191-2019-0048.*

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