Department of Foreign Languages TSC RAS SB
May 17, 2019
10.00 AM, Room 1

SESSION 1
10.00 AM – 12.00 PM
Chair: **prof. Aleksandr Konoshonkin** (IAO)

Opening word: **Iuliia Zelichenko** (Head of DFL)

Welcome address: **Nadejda Nebogina**, PhD in Chemical Sciences, Senior Staff Scientist, Laboratory of oil Rheology, IPC RAS SB; **Aleksei Kobzev,** PhD in Engineering, Chair of The Council of Young Scientists and Specialists, IMCES RAS SB.

1. **Ekaterina Savrasova**
   Institute of Petroleum Chemistry
   Laboratory of Oil Rheology
Complex additive for waxy crude oils
The influence of the additives of different composition on the structure and properties of waxy crude oils is described. The main differences in the structure and properties of resins and asphaltenes of the oils are show. The mechanism of how additives and oil components interact is explained.
Keywords: *parafin deposits, polimeric additives, modified petroleum resins, structures of petroleum resins and asphaltens.*

2. **Stepan Shestakov**
   V.E. Zuev Institute of Atmospheric Optics
   Laboratory of Optical Location
Incoherent imaging simulation and incoherent image correction in turbulence atmosphere
The work is devoted to simulating the propagation of electromagnetic radiation in turbulence atmosphere, imaging, and recovery of distorted images. The methods that help to achieve this are reported.
Keywords: *imaging, image recovery, atmosphere, simulation.*

3. **Alexey Goncharov**
   Institute of Petroleum Chemistry
Thermal stability of components of tars of various composition
Due to the decline in light oil reserves, the need for processing heavy oil residue into light fractions increases. Non-conventional feeds such as vacuum residue (VR) have shown an alternate source for the production of high value transportation fuels, as it is abundantly available. But the high content of resinous asphaltene substances and heteroatomic compounds complicates the processing considerably, as a result, heavy raw materials are not developed practically. The purpose of the work was to study the composition and identification of basic laws of thermal destruction of the components of the tars of different origin. The features of changes in the material and fractional composition of cracking products depending on the duration of the process are established. The increase in the duration of the process led to an increase in the formation of gas and coke. The sulfur content in the cracking liquid products was investigated.
Keywords: *tar, cracking, resins, asphaltenes.*

4. **Aleksandr Krainiukov**
   Institute of Monitoring of Climatic and Ecological Systems
   Laboratory of Bioinformatics Technologies
Radiocarbon dating (review)
Archaeology has a greater impact on our understanding of the human past than any other field. Archaeology was one of the first and remains the major discipline to use radiocarbon dating. Radiocarbon dating is a method that gives an approximate age of organic material, usually within a range of a few years. This review covers the basics of Radiocarbon dating, including sample requirements, samples preparation, synthesis and preparation of benzene, and the process mechanism.

Keywords: *radiocarbon dating, archaeology, isotopes, QUANTULUS, benzene, accelerator mass spectrometer.*

5. **Anastasia Arysheva**
   Institute of Petroleum Chemistry
   The Laboratory of Heteroorganic Petroleum Compounds

Study of the composition of Usinsk heavy fuel oil

The increasing share of heavy oils in the total production volume necessitates the research and development of new efficient ways of processing raw materials. In this regard, composition and structure of compounds found in heavy oil from the Usinsk field using the methods of adsorption chromatography and chemical degradation have been studied. With the results obtained, it is possible to make an assumption about the further development prospects in this direction.

Keywords: *heavy oil, asphaltenes, tar, fuel oil.*

6. **Ekaterina Lukanina**
   Institute of Monitoring of Climatic and Ecological Systems
   Laboratory of Monitoring of Forest Ecosystems

The dependence of tree pollen production on weather conditions in the south of West Siberia

In the present study we have investigated the dependence of the composition of the modern spore and pollen spectra on the composition of the vegetation cover in the southern part of Western Siberia (south of the Tomsk region) using the Tauber traps. We also found the correlation between the spore and pollen spectra and the actual weather conditions in the year of study.

Keywords: *spore and pollen spectra, Tauber traps, climate monitoring.*

7. **Alena Rodina**
   V.E. Zuev Institute of Atmospheric Optics
   Laboratory of Theoretical Spectroscopy

Improvement of line list for 12CH4 in a range of 3760–4100 cm^{-1} of the first principle

Eight spectra of normal samples of CH4 in the 3760–4100cm^{-1} region were recorded by using a Fourier transform spectrometer in Reims, France at long paths (202m, 602m, 1604m and 1804m) and different pressures. Additional spectra of 12CH4 covering the same region were obtained at 100K and very low sample pressures, which was used for low-J line position identification. Line positions and intensities were retrieved by least squares curve-fitting procedures and analyzed using the effective Hamiltonian and the effective dipole. A new measured line list contains positions and intensities for 9000 features. Quantum assignments were made for more than 3500 new transitions, which represent ~95% of the integrated line intensity observed in this region. The resulting list of lines is much more accurate than the list of lines HITRAN 2016. All assigned 5703 line positions were fitted to RMS standard deviations of 0.0018 cm^{-1} . The sum of observed intensities between 3760 and 4100 cm^{-1} fell within 2% of the predicted value from ab initio variational calculations reported in the TheoReTS database.

Keywords: *CH4, effective Hamiltonian, high resolution spectra, infrared absorption intensities.*

8. **Nikolai Soltaganov**
   Institute of Monitoring of Climatic and Ecological Systems
   Laboratory of Bioinformation Technologies

Classification of forecasting methods and models

Time series forecasting is important because it can often provide the foundation for decision making in a large variety of fields. Here we present classification of the methods and models of time series forecasting, including modern methods in the field of forecasting.

Keywords: *regression models, neural networks, time series, forecasting, climate.*

END OF SESSION 1
COFFEE BREAK (30 min)

SESSION 2
12.30 PM – 2.30 PM
Chair: **Elizaveta Petrikova** (IHCE RAS SB)
      Margarita Khimich (ISPMS RAS SB)

<u>Welcome address</u>: **Ilia Vlasov**, PhD in Engineering Science, Chair of The Council of Young Scientists and Specialists, ISPMS RAS SB; **Maksim Vorobiov**, PhD in Engineering Science, Staff Scientist, IHCE RAS SB.

9. **Veronika Utiaganova**
   Institute of Strength Physics and Materials Science
   Laboratory for quality control in materials and structures

Structural-phase state of the wire-feed electron beam additive manufactured (EBAM) Ti-6Al-4V

The goal of the research was to study the structure, phase composition and microhardness of Ti-6Al-4V alloy obtained using wire-feed electron beam additive manufacturing. The correlation between increasing Vickers hardness values and an increase in the thickness of the deposited layers was found.

Keywords: *additive manufacturing, titanium alloy, microstructure, microhardness.*

10. **Alihan Amirov**
    Institute of Strength Physics and Materials Science

Lap welded joint of aluminum and titanium alloys by friction stir welding

The process of obtaining a lap welded joint of dissimilar materials (titanium and aluminum alloys) is described. Samples were cut across the cross-section. The microstructure and the element analysis of the cross-section of the lap welded joint specimens have been studied. Investigation of the specimen's microstructure showed that a formation of welded joint has occurred mainly due to mechanical mixing of titanium and aluminum alloys. A tensile test of welding joint was carried out.

Keywords: *friction stir welding, titanium alloy, aluminum alloy, strength, element analysis.*

11. **Andrei Vorontsov**
    Institute of Strength Physics and Materials Science
    Laboratory of Local Metallurgy In Additive Technologies

Ultrasonic-assisted laser welding on 13Mn6 steel

This work presents the results of a comparative study of the macro- and microstructure of the welded joints on 13Mn6 steel, obtained using laser and ultrasonic-assisted laser welding. Geometric parameters, mechanical strength and macro- and microstructure of welded joint zones have been studied and compared.

Keywords: *laser welding, ultrasonic-assisted, steel.*

12. **Aleksandr Lenskii**
    Institute of High Current Electronics
    High Energy Density Department

Compact LTD-stage

Here we present a compact linear transformer driver (LTD) based on a recently designed HCEIcsa160 capacitor-switch assembly. The LTD stage comprises twelve capacitor-switch assemblies (CSAs) connected in parallel to a matched load. Estimations suggest that when switched in sync, such CSAs can provide a current pulse with an amplitude of 1.1 MA and rise time of 100 ns at a matched load of 0.067 Ohm, which corresponds to a pulsed power of 80 GW. The small dimensions and high output power of the LTD stage can allow for its successful use as a driver of low-impedance loads in laboratory studies and as a standard element of pulsed power accelerators.

Keywords: *LTD stage, capacitor-switch assembly, pulsed power accelerator.*

13. **Nikita Prokopenko**
    Institute of High Current Electronics

Laboratory of Plasma Emission Electronics
Synthesis of multilayer coatings using vacuum arc plasma-assisted technique

The possibility of obtaining multilayer metal/ceramic coatings using an original method is described. The originality of the method is in the deposition of multilayer metal/ceramic coatings with relatively sharp boundaries. For this purpose, the deposition was carried out at a constant working pressure and the ratio of gases and the arc discharge current of the evaporator. A transition from the metallic to the nitride layer was carried out by changing plasma parameters of a non-self-sustaining arc discharge with a combined heated and hollow cathode. Such method is of low inertia, which made it possible to increase the repeatability of thickness and composition of the layers. It also allowed for deposition at a lower operating pressure to produce coatings with denser packaging and lower porosity.

Keywords: *arc deposition, multilayer coatings, Ti / TiN.*

14. Evgenii Ostroverkhov

Institute of High Current Electronics
Laboratory of Plasma Emission Electronics

The effect of the mesh emission electrode shape on the distribution of the plasma density generated in the working chamber

The research of the influence of the shape of emission mesh electrode on the distribution of plasma density generated in the hollow cathode of low-pressure glow discharge was implemented. Radial and azimuthal distributions of the ion current density were measured for six shapes of the mesh emission electrode. For each shape the non-uniformity factor of the ion current density distribution was calculated.

Keywords: *emission mesh electrode, plasma density, low-pressure glow discharge, hollow cathode, azimuthal distribution.*

15. Danil Ignatov

Institute of High Current Electronics
Laboratory of Plasma Emission Electronics

Plasma generation in a non-self-sustained glow discharge with a hollow cathode for chemical-thermal treatment of inner surfaces of complex shape cavities

Until recently ion-plasma treatment of inner surfaces of complex shape cavities has remained technologically difficult to realize. The work is devoted to ion-plasma treatment methods.

Keywords: *glow discharge, non-self-sustained discharge, low-temperature plasma, hollow cathode, ion-plasma nitriding, modification of metal alloys.*

END OF SESSION 2
OPEN FLOOR FOR FINAL COMMENTARY

Closing word: Chair