# 6th INTERNATIONAL FALL SCHOOL ON ORGANIC ELECTRONICS – 2020 (IFSOE-2020)

## Organizers

Division of Chemistry and Material Science of Russian Academy of Sciences

The Ministry of Science and Education of Russia

Enikolopov Institute of Synthetic Polymeric Materials of Russian Academy of Sciences (ISPM RAS)

Lomonosov Moscow State University (MSU)

Printed Electronics Technologies Limited Liability Company (PrintElTech LLC)

Eklogit Limited Liability Company (Eklogit LLC)

## Scientific program

1) ***Fundamentals of organic electronics:*** charge transport, modeling, photophysics, etc.

2) ***Design and synthesis of materials for organic electronics:*** organic conductors and semiconductors, dielectrics, substrates, etc.

3) ***Organic field-effect transistors:*** single crystal, polymer and monolayer OFETs, integrated circuits and related devices.

4) ***Organic light-emitting devices:*** OLEDs and OLETs, white light-emitting devices, TADF devices, organic lasers.

5) ***Organic and hybrid solar cells:*** small molecules and polymer photovoltaics, tandem cells, perovskites-based photovoltaics, etc.

6) ***Organic sensors:*** physical (pressure, temperature, photo, etc.) sensors, chemo- and biosensors.

7) ***Characterization techniques:*** various spectroscopy, microscopy, and x-ray scattering techniques, charge mobility measurements, thermal and surface analysis, HOMO and LUMO evaluation, biomedical applications, etc.

8) ***Technologies of organic electronics:*** printing of organic materials and devices, roll-to-roll techniques, ink formulations, encapsulation, etc.

## School-conference Chairs

Prof. Sergey Ponomarenko (Enikolopov Institute of Synthetic Polymeric Materials of RAS, Russia)

Prof. Dmitry Paraschuk (Lomonosov Moscow State University, Russia)

## International Advisory Board

Prof. Vladimir Agranovich (Institute for Spectroscopy RAS, Russia)
Prof. Mikhail Alfimov (Photochemistry Center of RAS, Russia)
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Dr. Abderrahim Yassar (Ecole polytechnique, France)

## Local Organizing Committee

Dr. Elena Agina – *Vice Chairman*
Victoria Chekusova – *workshop secretary*
Askold Trul
Daniil Anisimov
Polina Shaposhnik

## Financial support

IFSOE-2020 was supported by RSF (project № 19-73-30028)

## Notification

This year IFSOE-2020 will be organized in the online form via Zoom-platform. Please visit IFSOE-2020 web-site (http://www.ifsoe.ru/)for details.

# School program

# *The 6th International Fall School on Organic Electronics – 2020 Time Schedule*

*Moscow, Russia (GMT+3)*

| | **Monday** *September 14th* | **Tuesday** *September 15th* | **Wednesday** *September 16th* | **Thursday** *September 17th* |
|---|---|---|---|---|
| | ***School*** | | | |
| 9:45 - 10:00 | **School opening Chihaya Adachi** | | | |
| 10:00 - 10:45 | | **Vladimir Dyakonov** | | |
| 10:45 - 11:30 | **Christoph Brabec** | **George Malliaras** | | |
| 11:30 - 12:00 | **Coffee-break** | | | |
| 12:00 - 12:30 | **Maxim Kazantsev** | **Maxim Scherbina** | | |
| 12:30 - 13:00 | **Pavel Troshin** | **Artem Bakulin** | | |
| 13:00 - 13:30 | Oral talks 1 | **Dai Zhang** | | |
| 13:30 - 14:30 | **Lunch** | | | |
| 14:30 - 16:00 | Poster session 1 | Poster session 3 | | |
| 16:00 - 16:45 | **Coffee-break** | | **Antoine Kahn** | |
| 16:45 - 17:30 | Poster session 2 | Poster session 4 | **Daniel Frisbie** | **Natalie Stingelin** |
| 17:30 - 18:00 | | | **Kostas Daoulas** | **Oana D. Jurchescu** |
| 18:00 - 18:30 | | | Oral talks 2 | **Johannes Gierschner** |
| 18:30 - 19:00 | | | | Oral talks 3 |
| 19:00 - 19:30 | | | | **School closing** |

## Monday, September 14th

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|---|---|
| | Chair: *Dmitry Paraschuk* |
| 9:45 – 10:00 | **School opening** |
| 10:00 – 10:45 | **T-1.** *Chihaya Adachi.* Recent Progress in Advanced Blue TADF OLEDs |
| 10:45 – 11:30 | **T-2.** *Christoph Brabec.* Resolving Long Time Challenges in Emerging Photovoltaics with Autonomous Self-Driven Labs |
| 11:30 – 12:00 | **Coffee-break** |
| | Chair: *Yuriy Luponosov* |
| 12:00 – 12:30 | **I-1.** *Maxim Kazantsev.* Highly-Luminescent Furan/Phenylene Co-Oligomers |
| 12:30 – 13:00 | **I-2.** *Pavel Troshin.* What is Killing Organic Photovoltaics: Light-induced Crosslinking as a General Degradation Pathway of Organic Conjugated Molecules |
| | **Oral talks 1.** |
| 13:00 – 13:15 | **O-1.** *Alexei Komolov.* Electronic Properties and Structuring of Vacuum Evaporated Molecular Films on Solid Surfaces |
| 13:15 – 13:30 | **O-2.** *Benedito A. L. Raul.* Excited State Dynamics in a Novel Solution Processable Triphenylamine-Based Small Molecule for Organic Optoelectronics |
| 13:30 – 14:30 | **Lunch** |
| 14:30 – 16:00 | **Poster session 1 (*P-1 – P-17*)** |
| 16:00 – 16:30 | **Coffee-break** |
| 16:30 – 18:00 | **Poster session 2 (*P-18 – P-34*)** |

## Tuesday, September 15th

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| | Chair: *Artem Bakulin* |
| 10:00 – 10:45 | **T-3.** *Vladimir Dyakonov.* Spectroscopy of Organic and Hybrid Materials and Thin-Film Optoelectronic Devices - a Delicate Issue |
| 10:45 – 11:30 | **T-4.** *George Malliaras.* Electronics on the Brain |
| 11:30 – 12:00 | **Coffee-break** |
| | Chair: *Maxim Kazantsev* |
| 12:00 – 12:30 | **I-3.** *Maxim Shcherbina.* Modern Approaches to the Studies of Thin Films and Monolayers: X-Ray Reflectometry, Grazing Incidence Scattering and Standing Waves |
| 12:30 – 13:00 | **I-4.** *Artem Bakulin.* Ultrafast Spectroscopy of Electron-Phonon Effects in Hybrid Perovskite Electronic Materials |

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| 13:00 – 13:30 | **I-5.** *Dai Zhang.* Revealing the Photo-Physical Properties of Optoelectronic Materials at the Nanometer Scale Using Optical Microscopy |
| 13:30 – 14:30 | **Lunch** |
| 14:30 – 16:00 | **Poster session 3 (*P-35 – P-50*)** |
| 16:00 – 16:30 | **Coffee-break** |
| 16:30 – 18:00 | **Poster session 4 (*P-51 – P-66*)** |

## Wednesday, September 16th

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| | Chair: *Vladimir Dyakonov* |
| 16:00 – 16:45 | **T-5.** *Antoine Kahn.* Electronic Properties of Contacts to Organic Semiconductors |
| 16:45 – 17:30 | **T-6.** *Daniel Frisbie.* Imaging Defects and Electronic Disorder in Organic Semiconductors |
| 17:30 – 18:00 | **I-6.** *Kostas Daoulas.* Multiscale Modelling of Semiconducting Polymers |
| | **Oral talks 2.** Chair: *Oleg Borshchev* |
| 18:00 – 18:15 | **O-3.** *Alexandra Freidzon.* Thermally Activated Delayed Fluorescence in Organic Semiconductors: A Quantum Chemical Study |
| 18:15 – 18:30 | **O-4.** *Rishabh Saxena.* A Kinetic Monte Carlo Study of Triplet-Triplet Annihilation in Conjugated Luminescent Materials |
| 18:30 – 18:45 | **O-5.** *Jeannine Grüne.* Interplay Between RISC and TTA in Exciplex-Based TADF OLEDs |
| 18:45 – 19:00 | **O-6.** *Andrey Sosorev.* Organic Nanoelectronics Inside Us: Charge Transport and Localization Within tRNA Could Orchestrate Ribosome Operation |
| 19:00 – 19:15 | **O-7.** *Yuriy Luponosov.* Novel Star-shaped Donor-Acceptor Molecules for Bulk Heterojunction and Single-Material Organic Solar Cells |

## Thursday, September 17th

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| | Chair: *Dmitry Paraschuk* |
| 16:45 – 17:30 | **T-7.** *Natalie Stingelin.* The Principles of Manipulating the Phase Transformations, Solid-State Order and Properties of Organic Functional Matter |
| 17:30 – 18:00 | **T-8.** *Oana D. Jurchescu.* Charge Injection in Organic Field-Effect Transistors: from Fundamentals to Applications |
| 18:00 – 18:30 | **I-7.** *Johannes Gierschner.* Dual Emission: Classes, Mechanisms and Conditions |
| | **Oral talks 3.** |
| 18:30 – 18:45 | **O-8.** *Sergey Novikov.* Charge Carrier Recombination in Amorphous Organic Semiconductors |

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| 18:45 – 19:00 | **O-9.** *Vladimir Nikitenko.* Extended Description of Hopping Transport by the Multiple Trapping Model |
| 19:00 – 19:30 | **School closing** |

## Poster session 1

Monday, September 14th, 14:30

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| Abramov, Anton A. | P1 | Portable Device for Measuring of OFETs Array Parameters Allowing Detection and Determination of Various Gases |
| Agafonova, Ekaterina E. | P2 | Revealing the Impact of Small Molecular Hole-Transport Materials on the Performance of Perovskite Solar Cells |
| Akbulatov, Azat F. | P3 | Intrinsic Stability Challenges in Design of Absorber Materials for Lead Halide Perovskite Solar Cells |
| Avrorov, Pavel A. | P4 | Electrochemical Reduction of Polyfluorinated Quinoxalines |
| Avrorov, Pavel A. | P5 | Electrochemical Reduction of Fluorinated/Chlorinated 2,1,3-benzothia/selenadiazoles |
| Balakirev, Dmitry O. | P6 | Novel Donor Small Molecules Based on Benzotriindole and Benzodithiophene Cores: Synthesis, Properties and Application in Organic Solar Cells |
| Borzdun, Natalia I. | P7 | Carboxyl-Containing Asphaltenes as Promising Acceptor Materials for Bulk Heterojunction Solar Cells |
| Chetyrkina, Margarita R. | P8 | Biocompatibility Assessment of Organic Semiconductors in the Context of Their Application in Wearable and On-Skin Electronics |
| Dolzhikova, Ekaterina A. | P9 | Simple Interfacial Passivation for HTL-Free Perovskite Solar Cells with Carbon Top Electrodes |
| Dyadishchev, Ivan V. | P10 | Synthesis and Properties of Luminescent Oligo(phenylene-thiophene)s with Various Types of Solubilizing Groups |
| Emelianov Nikita A. | P11 | Neuro-Like Oscillators System Based on PANI/PVDF-TrFE Memristor |
| Fedina, Elena S. / Somova Anna I. | P12 | Poly-(N-methylaniline) and Dihydrophenazine-Based Copolymers as Promising Cathode Materials for Dual-Ion Batteries |
| Fedorenko, Roman S. | P13 | High Performance 2D Field-Effect Transistors Based on Novel Tetrathienothiophene Derivatives |
| Gudeika Dalius | P14 | Methoxycarbazolyl-Substituted Oxygafluorenes as Bipolar Hosts for PhOLED and TADF-Based OLEDs |
| Kalinichenko, Nadezhda K. | P15 | Synthesis and Study of Properties of Linear Oligothiophenes End-Capped with Methyldicyanovinyl and Ethyl Cyanoacetate Groups |
| Kapaev, Roman R. | P16 | New Ladder-Type Conjugated Polymer with Hexaazatriphenylene Fragments as a Cathode Material for Li-, Na- and K-Based Batteries |
| Komarov, Denis S. | P17 | Novel Anolyte Material for High Voltage Non-Aqueous Organic Redox Flow Batteries |

## Poster session 2

Monday, September 14th, 16:30

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|---|---|---|
| Borshchev, Oleg V. | P18 | New Organic Semiconductors for Organic Electronics |
| Borshchev, Oleg V. | P19 | New Organic Luminophores for Scintillation and Wavelength Shifting Fibers |
| Komarov, Pavel V. | P20 | Design of Multiscale Simulation Models of Photovoltaic Polymeric Nanocomposites |

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| Krysko, Ilya D. | P21 | Hole Hopping in Dimers of N,N′ di(1-naphthyl)-N,N′-diphenyl-4,4′-diamine (α-NPD): a Theoretical Study |
| Kushch, Nataliya D. | P22 | Novel Organic Metal $BEDO_4Dy(OH)_6$ $4(H_2O)$ $(H_2OW3\text{-}H\text{-}OW3H_2)$. Based on π-Donor BEDO and $[Dy(NO_3)_5]^{2-}$ Anion: Synthesis, Structural Peculiarities and Conductivity |
| Kusnetsov, Ilja E. | P23 | Synthesis of Novel (X-DADAD)n Polymers with Fluorene and Phenylene X Blocks and Their Application in Organic Solar Cells |
| Mandal, Suman | P24 | Organic Field-Effect Transistors-Based Flexible Temperature Sensor for Healthcare Applications |
| Mikheeva, Aleksandra N. | P25 | Incorporation of Vanadium (V) Oxide in Hybrid Hole Transport Layer Enables Long-Term Operational Stability of Perovskite Solar Cells |
| Mikheeva, Maria M. | P26 | Exploring the Substitution of $Pb^{2+}$ with $Ca^{2+}$ in the $CsPbI_3$ \ Perovskite System |
| Moshkina, Tatiana N. | P27 | Benzodiazine Derivatives: Synthesis and Fluorescence Sensory Ability |
| Mosina, Ekaterina V. | P28 | Design of Hybrid Hole-Transport Layers for Efficient and Stable Perovskite Solar Cells |
| Obrezkov, Filipp A. | P29 | Polydiphenylamine-Based Cathodes for Dual-Ion Batteries |
| Ozerova, Victoria V. | P30 | Impact of Surface Passivation Coatings on Intrinsic Photochemical and Thermal Stability of Lead Halide Perovskites |
| Parfenov, Alexey A. | P31 | Highly Sensitive and Selective Ammonia Gas Sensor Based on $FAPbCl_3$ Lead Halide Perovskite |
| Polinskaya, Marina S. | P32 | Design and Synthesis of Functional Derivatives of [1] benzothieno[3,2-B][1]-benzothiophene for Use in Organic Electronic |
| Rohnacher, Valentina | P33 | Design of a Novel Tetrapodal Self-Assembled Monolayer for Functional Engineering of Interfaces |
| Zaborin, Evgeniy A. | P34 | Synthesis and Properties of Novel Nanostructured Organosilicon Luminophores for Scintillation and Wavelength Shifting Fibers |

## Poster session 3

Tuesday, September 15th, 14:30

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| Anisimov, Daniil S. | P35 | Predicting Properties of OFET-based Sensors by Their Electrical Characteristics |
| Dominskiy, Dmitry I. | P36 | Study of Charge Injection in Thiophene-Phenylene Co-Oligomers via Their Terminal Substitution |
| Doroshkevich, Aleksandr S. | P37 | Hydrophilic Organo-Inorganic Composite Systems Based on $ZrO_2$ Nanopowders – the Promising Materials for Adsorption Electronics and Power Engineering |
| Khmelnitskaya, Alina G. | P38 | Dielectric Properties of Polymer Composites Based on Polydimethylsiloxane and Carbon Fillers |
| Proshin, Pavel I. | P39 | Novel Thiazolothiazole-Based Donor-Acceptor Conjugated Polymers for Large-Area Organic Solar Cells |
| Romadina, Elena I. | P40 | New Low Bandgap Polymer for Self-Powered Organic Near-Infrared Photodetectors |

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| Roy Dhrubojyoti | P41 | Enhanced Non-Volatile Attribute of FeFET Based Memory Device via Tuning of Ferroelectric Microstructure |
| Saunina, Anna Yu. | P42 | An Analysis of J-V Characteristics of QD-Based Photovoltaic Cells from a Theoretical Model |
| Saxena, Rishabh | P43 | A Kinetic Monte Carlo Study of Triplet-Triplet Annihilation in Conjugated Luminescent Materials |
| Shcherbakov A. G. | P44 | Polyimides Based on NTCDA and p- or m-Phenylenediamines as Cathode Materials for Potassium Batteries |
| Shundrin, Leonid A. | P45 | Ambipolar Polyimides with Pendant Groups Based on 9H-Thioxanthene-9-one Derivatives: Synthesis, Thermostability, Electrochemical and Electrochromic Properties |
| Skorotetcky, Maxim S. | P46 | Tetrathienoacene Derivatives for Monolayer Field-Effect Transistors |
| Solodukhin, Alexander N. | P47 | Effects of Thiophene π-Spacer Length and Fused Triphenylamine Core on Properties of Star-Shaped Molecules for Organic Solar Cells and Photodetectors |
| Sukhorukova, Polina K. | P48 | Novel Star-Shaped Benzotriindole-Based Donor-Acceptor Molecule for Organic Photovoltaics |
| Tepliakova, Marina M. | P49 | Strength of Attraction: Pyrene-Based Hole-Transport Materials with Effective π-π Stacking for Dopant-Free Perovskite Solar Cells |
| Trul, Askold A. | P50 | Inkjet Printed OFETs for sensing of Toxic Gases |

## Poster session 4

Tuesday, September 15th, 16:30

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| Bezsudnov, Igor V. | P51 | Two-Phase Composite Employing Liquid-Gas Phase Transition for Large Volume Expansion |
| Chekusova, Victoria P. | P52 | LS Monolayer OFETs with Outstanding Electrical Performing as Highly Sensitive Gas Sensors to Ethyl Mercaptan |
| Kuevda, Alexsey V. | P53 | Photoluminescence Anisotropy in Organic 2D Semiconductors |
| Mannanov, Artur L. | P54 | Spectral Technique for Precise Efficiency Measurements of Various Types of Advanced Solar Cells |
| Parashchuk, Olga D. | P55 | Anisotropic Low-Frequency Raman Scattering in Organic Semiconductors for Probing Non-Local Electron-Phonon Interaction |
| Shaposhnik, Polina A. | P56 | Water-Gated Organic Field-Effect Transistor Based on the Blend of 2,7-dioctyl[1]benzothieno[3,2-b][1]benzothiophene and Polysterene |
| Titova, Yaroslava O. | P57 | Ink-Jet Printing of PEDOT:PSS for Organic Electronic Devices |
| Trukhanov, Vasiliy A. | P58 | Electroluminescent 2D Organic Semiconductor Single Crystals with High Charge-Carrier Mobility |
| Ulyankin, Evgeny B. | P59 | Photochemical Synthesis of 4H-Thieno[3,2-c]chromene Derivatives |
| Ustinova, Marina I. | P60 | Impact of Lead Substitution on Stability and Photovoltaic Performance of Lead Halide Perovskites |

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| Vaneeva, Elizaveta E. | P61 | Liquid Metal Melt Electrodes for Low-Cost Perovskite Solar Cells |
| Vavilina, Regina R. | P62 | The Influence of Electron-Transport Layer Materials on the Electrochemical Stability of Perovskite Solar Cells |
| Yamilova, Olga R. | P63 | Influence of the Hole-Transport Layer on the Electrochemical Stability of Perovskite Solar Cells |
| Zelenyak, Tatyana Yu. | P64 | Studies of the Influence of Water Molecules on the Perovskite Structure $CH_3NH_3PbI_3$ |
| Zvyagina, Alexandra I. | P65 | Self-Assembly of Lanthanide Double-Decker Crown-Substituted Phthalocyaninates into 1D-Supramolecular Semiconductors |
| Maslennikov, Dmitry R. | P66 | Photocurrent Vibrationally Promoted Electronic Resonance Spectroscopy for Probing Electron-Phonon Couplings in Perovskite Solar Cells |