International Conference
IX Minsk International Seminar
Heat Pipes, Heat Pumps, Refrigerators, Power Sources

September 7–10, 2015
Minsk, Belarus

http://minskheatpipes.org/

PRELIMINARY PROGRAM

National Academy of Sciences of Belarus
A.V. Luikov Heat & Mass Transfer Institute
NIS Scientific Association “Heat Pipes”
Belarusian National Technical University

International Centre for Heat and Mass Transfer
LG Electronics
Belarusian Republican Foundation for Fundamental Research
TAIS Ltd.
THERCON-LHP Ltd
Organizers
National Academy of Sciences of Belarus
Luikov Heat & Mass Transfer Institute
NIS Scientific Association “Heat Pipes”
Belarusian National Technical University

Sponsors
International Center for Heat and Mass Transfer,
Ankara, Turkey
LG Electronics, Republic of Korea
Belarusian Republican Foundation
for Fundamental Research, Minsk, Belarus
Thermal Aggregates And Systems (TAIS) Co Ltd.,
Moscow Region, Russia
THERCON-LHP Ltd, Ekaterinburg, Russia

HONOURABLE NATIONAL SCIENTIFIC COMMITTEE

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Shenets L. V. First Deputy Minister of Energy of the Republic of Belarus
Tuzikov A. V. General Director of the United Institute of Informatics Problems of the National Academy of Sciences of Belarus
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### WORKING SCHEDULE
of the Conference “IX International Minsk Seminar
“Heat Pipes, Heat Pumps, Refrigerators, Power Sources”

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<tr>
<th>September 7, Monday</th>
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<tbody>
<tr>
<td>From 8:00</td>
<td>Registration of participants</td>
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<tr>
<td>9:30 – 10:30</td>
<td>Opening Ceremony</td>
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<tr>
<td>10:30 – 13:00</td>
<td>Session 1</td>
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<tr>
<td>13:00 – 14:00</td>
<td>Lunch-break</td>
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<tr>
<td>14:00 – 18:00</td>
<td>Session 2</td>
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<tr>
<td>16:00 – 16:20</td>
<td>Coffee-break</td>
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<tr>
<td>16:20 – 18:20</td>
<td>Session 2 (continuation)</td>
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<td>19:00</td>
<td>Welcome Party</td>
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<tr>
<th>September 8, Tuesday</th>
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<tr>
<td>9:00 – 13:00</td>
<td>Session 3</td>
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<tr>
<td>11:20 – 11:40</td>
<td>Coffee-break</td>
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<tr>
<td>11:40 – 13:00</td>
<td>Session 3 (continuation)</td>
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<tr>
<td>13:00 – 14:00</td>
<td>Lunch-break</td>
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<td>14:00 – 18:40</td>
<td>Session 4</td>
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<td>19:00</td>
<td>Banquet*</td>
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<th>September 9, Wednesday</th>
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<tr>
<td>9:00 – 11:20</td>
<td>Session 5</td>
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<tr>
<td>11:20 – 11:40</td>
<td>Coffee-break</td>
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<td>11:40 – 13:00</td>
<td>Session 6</td>
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<td>13:00 – 14:00</td>
<td>Lunch-break</td>
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<tr>
<td>14:00 – 15:00</td>
<td>Posters Session</td>
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<td>19:00</td>
<td>Cultural Program</td>
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<th>September 10, Thursday</th>
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<tr>
<td>9:00 – 13:00</td>
<td>Session 7</td>
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<tr>
<td>11:20 – 11:40</td>
<td>Coffee-break</td>
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<td>11:40 – 13:00</td>
<td>Session 7 (continuation)</td>
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<td>14:00 – 18:00</td>
<td>Session 8</td>
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<td>16:30 – 17:40</td>
<td>Session 8 (continuation)</td>
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<td>18:00 – 19:00</td>
<td>Closing Ceremony</td>
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*Time:* keynote lecture – **40 minutes**, paper presentation – **20 minutes**, including a discussion.

*Ladies program* includes Minsk sightseeing excursion, visits to the National Art Museum, Central Botanical Garden and National Souvenirs Shop.

*The cost of the Conference banquet will be announced at registration*
PROGRAM OF THE INTERNATIONAL CONFERENCE
“IX Minsk International Seminar
Heat Pipes, Heat Pumps, Refrigerators, Power Sources”

September 7, Monday

REGISTRATION OF PARTICIPANTS:
A.V. Luikov Heat & Mass Transfer Institute
P. Brovka str., 15
From 8:00

Opening Ceremony
9:30 – 10:30

Session 1.
10:30–13:00

O.G. Penyazkov
Belarus (Minsk)
Shock and adiabatic compression ignitions of inhomogenous gas and two-phase flows

S. Kakaç\textsuperscript{1}, A. Pramuanjaroenkij\textsuperscript{2}
\begin{footnotesize}1\textit{Turkey (Ankara)}, 2\textit{Thailand (Sakon Nakhon)}\end{footnotesize}
Single-phase and two-phase analysis of convective heat transfer with nanofluids

G.V. Kuznetsov, D.V. Feoktistov, E.G. Orlova
Russia (Tomsk)
Dynamics of evaporation in two-phase systems

A. Tongkratoke\textsuperscript{1}, A. Pramuanjaroenkij\textsuperscript{1}, A. Chaengbamrung\textsuperscript{2}, S. Kakaç\textsuperscript{3}
\begin{footnotesize}1, 2\textit{Thailand (1Sakon Nakhon, 2Bangkok)}, 3\textit{Turkey (Ankara)}\end{footnotesize}
The development of mathematical modeling for nanofluid as a porous media in heat transfer technology

S.C. Kaushik, S. Manikandan, R. Hans
India (Delhi)
Thermodynamic modelling of thermoelectric generator systems

13:00–14:00 – LUNCH-BREAK
Session 2  
14:00–18:20

R.M. Cotta, K.M. Lisboa, J.R.B. de Souza, Keynote Lecture  
A.B. Allahyarzadeh, J.B.R. Loureiro, C.P. Naveira-Cotta,  
Á.P. Silva Freire  
Brazil (Rio de Janeiro)  
Experimental-theoretical analysis of conjugated heat transfer in aeronautical  
sensors and structures with anti-icing systems

A.G. Fedorov Keynote Lecture  
USA (Atlanta)  
Exploiting nanoscale confinement for design of optimal  
evaporation/condensation Interface

V. Ayel, R. Bertossi, B. Mehta, N. Chauris, C. Romestant, Y. Bertin  
France (‘Futuroscope, ‘Ivry-sur-Seine)  
Evaporation of a thin liquid film in a heated capillary tube: experimental results  
and discussion on the related physical phenomena

Tsai Meng-Chang, Fong-Hao Wu, Wei-Chun Liao, Wei-Chi Su, Heng-Yi Li, Wen-FaTsai, Shung-Wen Kang  
Taiwan (‘Taoyuan, ‘Taipei)  
Operational characteristics of a reverse-loop thermosyphon with a large preheat  
accumulator

16:00–16:20 – COFFEE-BREAK

Session 2  
(Continuation)

J. Bonjour, R. Rullière, M. Clausse, C. Toublanc, Keynote Lecture  
F. Giraud, S. Michaïe  
France (Lyon)  
Studying pool boiling at subatmospheric pressure: a path toward more compact  
evaporators for sorption systems and a tool for an improved understanding of the  
bubble dynamics

S.T.R.Velásquez, G.G.V.Nuernberg, J.P.M. Florez, L.E. Vieira,  
M.B.H. Mantelli, A.N. Klein  
Brazil (Florianópolis)  
Development of multilayer porous media using colloidal processing
H.F. Smirnov, A.V. Zykov. 
_Ukraine (Odessa)_
The new approach to the drying processes modeling with respect of some deceleration mechanisms actions

A.M. Ilyanok, T.N. Timoshchenko, A.G. Smirnov, A.A. Stepanov
_Belarus (Minsk)_
Electro freezing/heating foil

P. Cheppudira Thimmaiah, A. Sharafian, W. Huttema, M. Bahrami
_Canada (Surrey)_
Effects of fin spacing and fin height of capillary-assisted tubes on the performance of a low-operating pressure evaporator for an adsorption cooling system

19:00 – WELCOME PARTY
September 8, Tuesday
Session 3
9:00–13:00

Yu.I. Aristov  
Keynote Lecture  
Russia (Novosibirsk)  
Current progress in adsorption technologies for low-energy buildings

B.B. Saha\textsuperscript{1}, I.I. El-Sharkawy\textsuperscript{1,2}, T. Miyazaki\textsuperscript{1}, S. Koyama\textsuperscript{1}  
Keynote Lecture  
\textsuperscript{1}Japan (Fukuoka), \textsuperscript{2}El-Mansoura (Egypt)  
Adsorption characteristics of ethanol on surface treated activated carbons and phenol resins for adsorptive cooling/refrigeration

D. Eysseric\textsuperscript{1}, C. Romestant\textsuperscript{1}, Y. Bertin\textsuperscript{1}, V. Ayel\textsuperscript{1}, A. Delmas\textsuperscript{2}  
France (Futuroscope, \textsuperscript{2}Cannes la Bocca)  
Multi-sources refrigerator for satellite active cooling

I.S. Girnik, Yu.I. Aristov  
Russia (Novosibirsk)  
Dynamics of water adsorption on loose grains of AQSOA\textsuperscript{TM}-FAM-Z02: a multi-layer configuration

M.Yu. Liakh, O.S. Rabinovich  
Belarus (Minsk)  
Adsorption refrigeration with phase transitions of working fluid in sorbent at minimal transport restrictions: 1D-model

11:20–11:40 – COFFEE-BREAK

Session 3
(Continuation)

S. Graf, D. Becker, J. Ackermann, F. Lanzerath, A. Bardow  
Germany (Aachen)  
Heat and mass transfer mechanisms in adsorption heat pumps: Experiment and dynamic modeling

L.L. Vasiliev\textsuperscript{1}, L.E. Kanonchik\textsuperscript{1}, A.P. Tsitovich\textsuperscript{1}, S.H. Alqahtani\textsuperscript{2}  
\textsuperscript{1}Belarus (Minsk), \textsuperscript{2}Saudi Arabia (Riyadh)  
Safe storage of gaseous fuel in a coupled state:  
I. Methane adsorption on microporous carbon fiber;  
II. CFD modeling of the adsorber with heat pipe
**B.I. Basok**, M.P. Novitska, E.V. Riasnova  
*Ukraine (Kyiv)*  
Hydrodynamics and heat transfer of vertical ground pile helical heat exchanger

**C. McCague**, K. Fayazmanesh, C. Berlanga, M. Bahrami  
*Canada (Messina)*  
Evaluation of CaCl₂-silica gel sorbent for water sorption cooling systems

**J.M. Costa Jr., C.P. Naveira-Cotta, C.P. Tostado, J.S. Nunes**  
*Brazil (Rio de Janeiro)*  
Design, fabrication and characterization of micro-reactors for biodiesel synthesis

13:00–14:00 – LUNCH-BREAK

**Session 4**

14:00–18:40

**M. Groll**  
*Germany (Stuttgart)*  
Heat pipe science and technology: a historical review

**V.V. Yagov**  
*Russia (Moscow)*  
Possible mechanisms of high-intensity heat transfer in cooling of high temperature surfaces

**B. Agostini, M. Habert**  
*Switzerland (Daettwil)*
Experimental characterization of a double back to back pulsating heat pipe for power electronics

**V.A. Alexeev¹, R.H. Arifullin¹, L.V. Karaban¹, A.E. Karabin¹, O.A. Eliseev¹, Y.A. Bryk¹, A.V. Sergeev¹, V.V. Maziuk², A.V. Voronkevich¹**  
*Russia (¹Moscow, ²Istra – Moscow Region, ³Belarus (Minsk))*  
Experimental studies of thermal conditions for powerful electronic devices with miniature heat pipes and unpackaged heat accumulators integrated therein

16:00–16:20 – COFFEE-BREAK
Session 4
(Continuation)

Yu. Kuzma-Kichta\textsuperscript{1}, M. Shustov\textsuperscript{1}, A. Lavrikov\textsuperscript{2}, A. Ustinov\textsuperscript{2}, I. Prokopenko\textsuperscript{3}, Yu. Shtefanov\textsuperscript{3}
\textit{Russia (\textsuperscript{1}Moscow, \textsuperscript{2}Skolkovo, \textsuperscript{3}Protvino – Moscow Region)}
Investigation of heat transfer in a heat pipe with nanoparticles coating

\textbf{M. Mochizuki}, Thang Nguyen, K. Mashiko, Y. Saito, S. Ahamed, R. Singh, Tien Nguyen, V. Wuttijumnong
\textit{Japan (Tokyo)}
Latest trends in heat pipe application

\textbf{S. Mori}, N. Maruoka, K. Okuyama
\textit{Japan (Yokohama)}
Critical heat flux enhancement of pool boiling using honeycomb porous plate with two-layer structure

\textit{Brazil (Florianópolis)}
Development of numerical tools for shell-and-shell thermosyphon heat exchanger design

\textbf{J.-A. Gruss}, A. Frere, A. Maisse, O. Soriano
\textit{France (Grenoble)}
Development of pulsating heat pipe with a central heating zone

\textbf{Wei-Keng Lin}
\textit{Taiwan (Hsinchu)}
Development of the heat pipe performance simulation program – HPPS by capillary wick theory

\textbf{A. Titlov}, E. Osadchuk
\textit{Ukraine (Odessa)}
The search of the water-ammonia absorption refrigeration machines’ energy efficient modes

19:00 – BANQUET
September 9, Wednesday
Session 5
9:00–11:20

Yu. Maydanik, V. Pastukhov
Russia (Ekaterinburg)
Copper-water loop heat pipes: issues and achievements

V.V. Kuznetsov
Russia (Novosibirsk),
Fluid flow and heat transfer with phase change in minichannels and microchannels

V.N. Buz
Ukraine (Odessa)
Modeling characteristics of fuel cells which use the ambient air oxygen

Yu.M. Matsevity, N.B. Chirkin, M.A. Kuznetsov, E.V. Sherstov
Ukraine (Kharkov)
Using the exergoeconomic method in design of heat pump systems for heating and cooling of housing and communal facilities

K. Fayazmanesh, C. McCague, M. Bahrami
Canada (Surrey)
Graphite-doped composite adsorbent coatings for heat-driven water sorption cooling systems

11:20–11:40 – COFFEE-BREAK

Session 6
11:40 – 13:00

A.A. Mohamad¹, H.Z. Hassan²
¹Canada (Calgary), ²Saudi Arabia (Riyadh)
Mathematical modeling of the adsorption cooling reactor

G.G. Ilis¹, G. Arslan², M. Mobedi³
¹,²Turkey (¹Manisa, ²Izmir), ³Japan (Hamamatsu)
Optimum design of an adsorbent bed of adsorption refrigeration system for highest specific cooling power

A. Sharafian, P.C. Dan, W. Huttema, M. Bahrami
Canada (Surrey)
Novel expansion and control valves design for two-bed adsorption cooling system

13:00–14:00 – LUNCH-BREAK
V.N. Buz \textsuperscript{1}, K.A. Goncharov\textsuperscript{2}  \\
\textsuperscript{1}Ukraine (Odessa), \textsuperscript{2}Russia (Khimki – Moscow Region)  
Vapor generating in the loop heat pipe evaporators. Modeling and analyses

D. Mishkinis\textsuperscript{1}, A. Kulakov\textsuperscript{1}, J. Meléndez\textsuperscript{1}, E. Turrión\textsuperscript{1}, A. Torres\textsuperscript{1}, M. Czupalla\textsuperscript{2}, B. Daly\textsuperscript{2}, C. Scharl\textsuperscript{2}  \\
\textsuperscript{1}Spain (Madrid), \textsuperscript{2}Germany (Munich)  
Active thermal control system with two parallel LHPS and pressure regulating valves

A.P. Lukisha\textsuperscript{1}, D.A. Mishkinis\textsuperscript{2}  \\
\textsuperscript{1}Ukraine (Dnepropetrovsk), \textsuperscript{2}Spain (Madrid)  
Effectiveness study of combined subcooler-capillary blocker device in LHP for space applications

V.V. Maziuk, A.A. Antuh  
Belarus (Minsk)  
Effectiveness study of combined subcooler-capillary blocker device in LHP for space applications

A.S. Ionov, Y.V. Kiliba, I.V. Romanov, A.V. Petrov  
Russia (Veliky Novgorod)  
The cooling system on specialized capillary heat pipes

A.V. Voronkevich  
Russia (Istra – Moscow Region)  
Numerical simulation of unsteady heat transfer in thermocontrol system based on gas-regulated heat pipe

R.R. Riehl  
Brazil (São José)  
Passive thermal management of surveillance systems using pulsating heat pipes

Fu-long Liu, Chun-lin Li  
China (Beijing)  
Design of low temperature system to infrared space telescope

O.N. Kaban’kov, L.A. Sukomel, V.V. Yagov, N.O. Zubov  
Russia (Moscow)  
Heat transfer and hydrodynamics in thermosyphon loop with heated channels of different cross-section configuration
Tao Ding, Zhiguang He, Zhen Li

*China (Beijing)*

Data center cooling using separated heat pipe system

F.S. Khosroshahi¹, T. Salem ¹, M. Arik ¹, M.O. Hamdan²

¹*Turkey (Istanbul), ²UAE (Abu Dhabi)*

Numerical and experimental analysis of a heat pipe embedded printed circuit board for solid state lighting applications

A.V. Seryakov, V.I. Ananiev, A.V. Orlov

*Russia (Veliky Novgorod)*

Condensation research in the short low-temperature range heat pipes

A.V. Seryakov, A.V. Konkin

*Russia (Veliky Novgorod)*

Numerical simulation of pulsations in vapour channel of low-temperature range heat pipes

V.V. Sorokin

*Belarus (Minsk)*

Modeling of the super atomization of hot water mini jet

V.I. Lutsenko, V.I. Yeliseyev

*Ukraine (Dnipropetrovsk)*

Experimental study of the vibration effect on the wetting hysteresis and capillary fluid motions

O.G. Burdo, S.G. Terziev, B.N. Bandura, N.V. Ruzhitskaya

*Ukraine (Odessa)*

Heat-and-mass transfer in micro- and nanoscale structures in targeted energy delivery conditions


*Ukraine (Kharkov)*

Numerical and experimental study heat-mass transfer with phase transition in capillary-porous structure of heat pipes

Yu.M. Matsevity, V.A. Tarasova, D.Kh. Kharlampidi

*Ukraine (Kharkov)*

Numerical and experimental testing of the thermodynamic efficiency of heat pumps

A. Alimgazin¹, S.G. Alimgazina¹, Y.M. Petin²

¹*Kazakhstan (Astana), ²Russia (Novosibirsk)*

Application of new generation heat pump technologies using alternative energy sources to generate additional heat energy at the heat power plants-2 (Astana-City)
N. Koneva, L. Domorod, A. Smargun  
*Belarus (Minsk)*  
Development of heat pump system with effective thermal storage

L.G. Gordeeva, M.V. Solovyeva, **Yu.I. Aristov**  
*Russia (Novosibirsk)*  
NH$_2$–MIL–125 as a promising material for adsorptive heat transformation and storage

S.M. Nemati Mehr, A. Sharafian, W. Huttema, M. Bahrami  
*Canada (Surrey)*  
In-situ water uptake rate measurement of AQSOA FAM-Z02 packed in finned tube adsorber beds of an adsorption cooling system

M. Rouhani, M. Bahrami  
*Canada (Surrey)*  
Improved lumping parameter model for phase change in latent thermal energy storage systems

R. Kaczmerek, **A.A. Stachel**  
*Poland (Szczecin)*  
Effectiveness of operation of ORC installation applied in the LNG regasification plant

**E.V. Romanova**, A.N. Koliukh, N.Z. Gatapova  
*Russia (Tambov)*  
Applying heat pump for drying in chemical and related technologies

B. Baghapour, **M. Rouhani**, M. Bahrami  
*Canada (Surrey)*  
Experimental design and performance analysis of a desiccant dehumidification column under cyclic operating condition

**S. Vasta**, V. Palomba, G. Gulli, A. Sapienza, O. Barbera, L. Bonaccorsi, A. Freni  
*Italy (Messina)*  
Performance assessment of a novel graphite adsorber for heat pumps and chillers

A.N. Kudrashov, **S.G. Kotov**, A.E. Sazonko, V.A. Saetchnikov, D.S. Kotau  
*Belarus (Minsk)*  
Forecasting of emissions during accidents on ammonia refrigeration units

19:00 –CULTURAL PROGRAM
September 10, Thursday

Session 7
9:00 – 13:00

K.A. Goncharov, V.N. Buz  
Russia (Khimki – Moscow Region)  
25 Years of loop heat pipes application on board Russian space crafts

L.L. Vasiliev\textsuperscript{1}, L.P. Grakovich\textsuperscript{1}, M.I. Rabetsky\textsuperscript{1}, L.L. Vasiliev Jr.\textsuperscript{1}, A.S. Zhuravlyov\textsuperscript{1}, A.V. Shapovalov\textsuperscript{2}, A.V. Rodin\textsuperscript{2}  
Belarus (\textsuperscript{1}Minsk, \textsuperscript{2}Gomel)  
Long thermostyphons for different applications

M. Habert, B. Agostini  
Switzerland (Daettwil)  
Pulsating air to air heat exchanger for enclosure cooling

Y. Beliavski  
Israel (Tiberias)  
Heat transfer in gases by pressure gradient elastic waves

A.N. Sokolov, N.N. Tarnovsky, M.Z. Schedrinsky, K.V. Rybas, M.G. Vorobiev, K.N. Sukharev, T.N. Sobolevskaya, A.I. Leonteva, A.D. Pavlova  
Russia (Saint-Petersburg)  
Experimental researches of startup and blocking of loop heat pipes of the spacecraft thermoregulation system

11:20–11:40 – COFFEE-BREAK

Session 7  
(Continuation)

X. Zhang, M.A. Arie, D.C. Deisenroth, A.H. Shooshtari,  
S.V. Desiatoun, M.M. Ohadi  
USA (Maryland)  
Impact of additive manufacturing on performance enhancement of heat exchangers: a case study on an air-to-air heat exchanger for high temperature applications
R. Koresawa, Y. Utaka  
Japan (Kanagawa)  
Improvement of performance of polymer electrolyte fuel cell using new gas channel with micro-grooves

A.V. Petrov$^1$, V.A. Karachinov$^2$, V.V. Kiliba$^1$, S.V. Ilin$^2$, A.S. Ionov$^1$, I.V. Romanov$^1$  
Russia ($^1$Veliky Novgorod, $^2$St. Petersburg)  
The study of manufacturing defects of capillary heat pipes

13:00–14:00 – LUNCH-BREAK

Session 8  
14:00 – 17:40

M. Mochizuki, Thang Nguyen, Y. Saito, Tien Nguyen, M.S. Ahamed  
Japan (Tokyo)  
A simple mathematical model to predict heat pipe maximum heat transfer, equivalent thermal conductivity and thermal resistance

Shilei Zhao, Tao Yang  
China (Beijing)  
The experimental research of controllable loop heat pipe with non-condensable gases

R. Singh$^1$, M. Mochizuki$^2$, Yu. Saito$^2$, T. Yamada$^2$, Th. Nguyen$^2$, T. Nguyen$^2$  
$^1$(Köln), $^2$Japan (Tokyo)  
Heat pipes applications in automotive electronics cooling

V.N. Buz$^1$, K.A. Goncharov$^2$, H.F. Smirnov$^1$  
$^1$Ukraine (Odessa), $^2$Russia (Khimki – Moscow Region)  
The surface tension forces influence on the film-wise condensation intensity

S.M. Khairnasov, Yu.E. Nikolaenko, B.M. Rassamakin, M.A. Lozovoi  
Ukraine (Kyiv)  
Investigation of characteristics of heat pipes for LED lighting device

16:00–16:20 – COFFEE-BREAK
V.V. Karnaukh$^1$, V.A. Mazur$^2$
_Ukraine ($^1$Donetsk, $^2$Odessa)_
Thermodynamic and hydrodynamic behavior of nanofluids in cooling systems

E. Bartuli, M. Guzej, J. Kominek, Ja. Horsky
_Czech Republic (Brno)_
Experimental investigation of a heat transfer coefficient for aluminum alloys

V.V. Klimakov$^1$, M.V. Chirkin$^1$, A.I. Ulitenko$^1$, A.V. Molchanov$^2$
_Russia ($^1$Ryazan, $^2$Moscow)_
Intensification of heat transfer between readout electronics and SINS outer frame using heat pipes

S. Khairnasov, B. Rassamakin, D. Kozak, A. Anisimova
_Ukraine (Kyiv)_
Experimental investigations of aluminum thermosyphons for photovoltaic-thermal module

18:00–19:00 – **Closing Ceremony**