



2015 International Conference on “Physics and Mechanics of New Materials and Their Applications” (PHENMA 2015)

**devoted to 100-year Anniversary of the
Southern Federal University**

Azov, Russia, May 19-22, 2015

<http://phenma2015.math.sfedu.ru>



**2015 International Conference
on "Physics and Mechanics of New Materials and Their Applications" (PHENMA 2015)
devoted to 100-year Anniversary of the Southern Federal University
Azov, Russia, May 19-22, 2015**

2015 International Conference on “Physics and Mechanics of New Materials and Their Applications” (PHENMA 2015)

**devoted to 100-year Anniversary of the
Southern Federal University
Azov, Russia, May 19-22, 2015**

<http://phenma2015.math.sfedu.ru>

Abstracts & Schedule

Abstracts and Schedule of the 2015 International Conference on Physics and Mechanics of New Materials and Their Applications (PHENMA 2015). I. A. Parinov, S.-H. Chang (Eds.). Southern Federal University Press: Rostov-on-Don, 2015. – 306 p.

ISBN 978-5-9275-1560-8

Advanced materials and composites, including piezoelectrics, nanomaterials, nanostructures, functional materials, polymeric composites and so on, have very importance for modern sciences, technologies and techniques. The success of the Russian-Taiwanese Symposium "Physics and Mechanics of New Materials and Their Applications", PMNM-2012 (Russia, 2012, <http://pmnm.math.rsu.ru/>), 2013 International Symposium "Physics and Mechanics of New Materials and Underwater Applications", PHENMA 2013 (Taiwan, 2013, <http://phenma.math.sfedu.ru>) and 2014 International Symposium "Physics and Mechanics of New Materials and Underwater Applications", PHENMA 2014 (Thailand, 2014, <http://phenma2014.math.sfedu.ru>) predefined objectives and scientific directions of the new conference PHENMA 2015, devoted to 100-year Anniversary of the Southern Federal University (Russia). The following PHENMA abstracts are divided into four scientific directions: (i) processing techniques of new materials, (ii) physics of new materials, (iii) mechanics of new materials, and (iv) applications of new materials. These are present by scientists from 20 countries, demonstrating strong scientific collaboration, formed for last years.

The present studies have been supported in partially by the Russian Foundation For Basic Research and the Ministry of Education and Science of the Russian Federation.

Published in author's edition.



2015 International Conference
on "Physics and Mechanics of New Materials and Their Applications" (PHENMA 2015)
devoted to 100-year Anniversary of the Southern Federal University
Azov, Russia, May 19-22, 2015

Sponsored by



Rostov Regional Administration, Russia



South Scientific Center of Russian
Academy of Science, Russia



Russian Foundation for Basic Research, Russia



Ministry of Science and
Technology of Taiwan

Ministry of Science and Technology



New Century Education Foundation

New Century Education Foundation, Taiwan



Ocean & Underwater Technology Association, Taiwan



Unity Opto Technology Co., Taiwan



EPOCH Energy Technology Co., Taiwan



Fair Well Fishery Co., Taiwan



Formosa Plastics Co., Taiwan



Woen Jinn Harbor Engineering Co., Taiwan



Longwell Co., Taiwan



Lorom Group, Taiwan



Taiwan International Ports Co., Taiwan



University of 17 Agustus 1945 Surabaya, Indonesia



Khon-Kaen University, Thailand



Don State Technical University, Russia



South Russian Regional Centre for Preparation and Implementation of International Projects, Ltd.



Organizing Committee

Conference Chairs

- I. A. Parinov (Southern Federal University, Russia)
S.-H. Chang (National Kaohsiung Marine University, Taiwan, ROC)

Advisory Chairs

- M. A. Borovskaya (Southern Federal University, Russia)
I. A. Brahmasari (University of 17 Agustus 1945 Surabaya, Indonesia)
C.-C. Chang (Taiwan International Ports Corporation, ROC)
C.-J. Chow (National Kaohsiung Marine University, Taiwan, ROC)
C.-K. Chou (New Century Education Foundation, Taiwan, ROC)
D.-H. Hsiao (Ocean & Underwater Technology Association, ROC)
I.-C. Huang (Fair Well Fishery Group, Taiwan, ROC)
V. I. Kolesnikov (Rostov State Transport University, Russia)
J. Lin (Formosa Plastics Co., Taiwan, ROC)
G. G. Matishov (South Scientific Center of Russian Academy of Sciences, Russia)
B. Ch. Meskhi (Don State Technical University, Russia)
D.-S. Wu (Da-Yeh University, Taiwan, ROC)

Conference Co-Chairs

- Y.-C. Chen (National Sun Yat-sen University, Taiwan, ROC)
L.-K. Chien (National Taiwan Ocean University, Taiwan, ROC)
R. Hastijanti (University of 17 Agustus 1945 Surabaya, Indonesia)
H.-C. Huang (National Kaohsiung Marine University, Taiwan, ROC)
V. V. Kalinchuk (South Scientific Center of Russian Academy of Sciences, Russia)
M. I. Karyakin (Southern Federal University, Russia)
M.-K. Lee (Chung Yuan Christian University, Taiwan, ROC)
K.-T. Lee (National Taiwan Ocean University, Taiwan, ROC)
C.-J. Lin (Formosa Plastics Co., Taiwan, ROC)
C.-T. Lin (National Kaohsiung Marine University, Taiwan, ROC)
V. S. Malyshevsky (Southern Federal University, Russia)
V. I. Minkin (Southern Federal University, Russia)
M. V. Seroshtan (Southern Federal University, Russia)

I. K. Shevchenko (Southern Federal University, Russia)
V. L. Sukhorukov (Southern Federal University, Russia)
S. Theerakulpisut (Khon Kaen University, Thailand)
J.-K. Wu (National Kaohsiung Marine University, Taiwan, ROC)
M.-C. Wu (National Tsing Hua University, Taiwan, ROC)
W.-K. Yeh, (National University of Kaohsiung, Taiwan, ROC)

Secretariats

V. A. Chebanenko (Southern Federal University, Russia)
Yu. V. Klunnikova (Southern Federal University, Russia)
E. P. Putri (University of 17 Agustus 1945 Surabaya, Indonesia)
M. S. Shevtsova (South Scientific Center of Russian Academy of Sciences, Russia)
M. V. Talanov (Southern Federal University, Russia)
H.-W. Tin (National Kaohsiung Marine University, Taiwan, ROC)
C. E. Vassilchenko (Southern Federal University, Russia)

Scientific Program Committee

O. A. Ageev (Southern Federal University, Russia)
Y.-Y. Bu (National Kaohsiung Marine University, Taiwan, ROC)
S. I. Builo (Southern Federal University, Russia)
S. Bureerat (Khon Kaen University, Thailand)
C.-N Chen (National Kaohsiung University of Applied Sciences, Taiwan, ROC)
R.-B. Chen (National Kaohsiung Marine University, Taiwan, ROC)
Y.-T Cheng (China University of Science and Technology, Taiwan, ROC)
P. Chindaprasirt (Khon Kaen University, Thailand)
K.-K. Chong (National Kaohsiung Marine University, Taiwan, ROC)
J.-J. Ho (National Taiwan Ocean University, Taiwan, ROC)
R.-H. Horng (National Chung Hsing University, Taiwan, ROC)
H.-S. Hung (National Taiwan Ocean University, Taiwan, ROC)
C.-L. Huang (National Kaohsiung Marine University, Taiwan, ROC)
M. A. Jani (University of 17 Agustus 1945 Surabaya, Indonesia)
P. Jaroenapibal (Khon Kaen University, Thailand)
F.-S. Juang (National Formosa University, Taiwan, ROC)
P. Kasemsiri (Khon Kaen University, Thailand)
S. Kingpaiboon (Khon Kaen University, Thailand)
K. Kamwilaisak (Khon Kaen University, Thailand)
J.-Y. Lee (National Kaohsiung Marine University, Taiwan, ROC)
P.-H. Lei (National Formosa University, Taiwan, ROC)
C.-F. Lin (National Taiwan Ocean University, Taiwan, ROC)

J.-H. Lu (National Kaohsiung Marine University, Taiwan, ROC)
I. P. Miroshnichenko (Don State Technical University, Russia)
A. V. Nasedkin (Southern Federal University, Russia)
A. E. Panich (Southern Federal University, Russia)
M. Poonprasit (Khon Kaen University, Thailand)
L. A. Reznichenko (Southern Federal University, Russia)
K. Saikaew (Khon Kaen University, Thailand)
K. Saengprachatanarug (Khon Kaen University, Thailand)
S. N. Shevtsov (South Scientific Center of Russian Academy of Sciences, Russia)
M.-C. Shihg (National University of Kaohsiung, Taiwan, ROC)
A. N. Soloviev (Don State Technical University, Russia)
M. A. Sumbatyan (Southern Federal University, Russia)
T.-Y. Sung (Chung Hua University, Taiwan, ROC)
V. Yu. Topolov (Southern Federal University, Russia)
A. O. Vatulyan (Southern Federal University, Russia)
F.-T. Wang (Hwa Hsia Institute of Technology, Taiwan, ROC)
H.-Y. Wang (National Kaohsiung University of Applied Sciences, Taiwan, ROC)
J.-P. Wang (National Kaohsiung Marine University, Taiwan, ROC)
N. Wongkasem (Khon Kaen University, Thailand)
J.-C. Wu (National Kaohsiung Marine University, Taiwan, ROC)
C.-C. Yang (National Kaohsiung Marine University, Taiwan, ROC)
C.-D. Yang (National Kaohsiung Marine University, Taiwan, ROC)
M.-Y. Yeh (National Kaohsiung Marine University, Taiwan, ROC)
S.-F. Zhao (National Kaohsiung Marine University, Taiwan, ROC)



Preface.....	22
--------------	----

TABLE OF ABSTRACTS

Arnold Abramov, Anna Abramova, Leonid Belevtsov, Chunlin Ji, Ruopeng Liu. Propagation of Electromagnetic Wave through 1D Periodic Structure Consisting of Linearly Changing Dielectric Permittivity Layers.....	23
A.G. Abubakarov, M.B. Manuilov, Y.M. Noykin, I.A. Verbenko, L.A. Reznichenko, M.S. Zakrieva. Features Microwave – Absorption of Electromagnetic Radiation Ferroelectric Niobium Complex Oxides.....	24
A.G. Abubakarov, A.V. Pavlenko, L.A. Reznichenko, I.M. Aliev, L.A. Shilkina, A.V. Nazarenko, I.A. Verbenko, G.M. Konstantinov. Features of the Microstructure and Dielectric Properties of (Ba _{0.50} Sr _{0.50})Nb ₂ O ₆ Ceramics.....	26
Achmad Daengs, GS, Nanang Sandi Wahyudi. The Planning of Preventive Maintenance Schedule to Save the Repairing Cost on Blow Moulding Department (Case Study at the Manufacturer Company in Surabaya).....	27
O.A. Ageev, A.A. Fedotov, V.S. Klimin, O.I. Ilin, Trinh Van Muoi, K.S. Sergienko, A.S. Semenov, V.Yu. Yanenko. Thermodynamic Analysis of Interaction in Structures Suitable for the Growth of Arrays of Carbon Nanotubes by PECVD.....	27
O.A. Ageev, O.I. Ilin, A.A. Fedotov, V.S. Klimin, M.V. Rubashkina, N.N. Rudyk, D.A. Suchkov. Development of Technology for Local Growing Single-Placed CNT.....	28
O.A. Ageev, O.I. Ilin, M.V. Rubashkina, V.A. Smirnov, V.V. Polyakova. Research on the Electric Parameters of Vertically Aligned Carbon Nanotubes by Scanning Tunnel Microscopy.....	29
O.A. Ageev, A.S. Kolomiytsev, A.V. Bykov, V.A. Smirnov, I.N. Kots. Use of Focused Ion Beam for Fabrication of Advanced Probes for Atomic Force Microscopy.....	30
O. A. Ageev, M. S. Solodovnik, S. V. Balakirev, I. A. Mikhaylin. InAs/GaAs(001) Quantum Dot Array MBE Formation Model Considering V/III Flux Ratio.....	31
O. A. Ageev, M. S. Solodovnik, S. V. Balakirev, I. A. Mikhaylin. Model of the Initial Stage of GaAs Homoepitaxial Growth by MBE Considering V/III Flux Ratio.....	32
V. O. Ageev, M. V. Rubashkina. Study of the Elasticity Human Epithelial Cells and Soft Materials in AFM Indentation Experiments.....	33
O. A. Ageev, E. G. Zamburg, I. A. Shipulin. Research of Parameters of Nanostructured ZnO Films during Chemisorption of Varius Gases.....	35
G.M. Akbaeva, V.G. Gavrilyachenko, A.F. Semenchov. Dynamic Fatigue during the Switching of Relaxor PZT-Based Ferroelectrics.....	36
Pavel Akishin, Evgeny Barkanov, Alexey Bondarchuk. Finite Element Modeling and Analysis of Curing and Pultrusion Processes.....	37
V.A. Akopyan, S.N. Shevtsov, I.A. Parinov, V.A. Chebanenko, Jiing-Kae Wu. Numerical and Experimental Study of Power Piezoelectric Stack Actuator for Rotorcraft Vibration Control.....	38
A.A. Alekseenko, V.E. Guterman, V.A. Volochaev. Optimization of Microstructure of Pt/C Catalysts for PEMFC.....	39

E. V. Andreev, A. S. Bogatin, Y. A. Ignatova, S. A. Kovrigina, A. L. Bulanova, T. Y. Privalova, I. O. Nosachev. Determination of the Parameters of the Relaxation Polarization.....	40
E. V. Andreev, A. S. Bogatin, S. A. Kovrigina, Y. A. Ignatova, V. N. Bogatina, A. L. Bulanova, I. O. Nosachev. An Extrapolation Method for the Definition of Distribution.....	41
E. V. Andreev, A. S. Bogatin, S. A. Kovrigina, Y. A. Ignatova, V. N. Bogatina, A. L. Bulanova, I. O. Nosachev. Extrapolation Method for Determining the Type of the Distribution with Limited Relaxation Times.....	42
K. P. Andryushin. New Anisotropic Materials.....	43
I. N. Andryushina. Correlation Bonds. Structure – Electrophysical Properties of the Binary PZT System.....	44
Anuwit Sonsiri, Thana Radpukdee. Automation and Process Control of a Rotary Dryer in a Granular Organic Fertilizer Drying Process.....	44
V.I. Avilov, V.A. Smirnov, O.G. Tsukanova. Correlation between Memristive Effect and Height of Titanium Oxide Nanostructures Produced by Atomic Force Microscopy.....	45
A. D. Azarov, D. A. Azarov. Description of Non-Linear Viscoelastic Deformations by the 3D Mechanical Model.....	46
Evgeny Barkanov, Pavel Akishin, Tony McNally, Mikhail Chebakov. Investigation of Mechanical Properties of Aluminum Alloys with Carbon Nanotubes.....	47
E.M. Bayan, T.G. Lupeiko, L.E. Pustovaya, A.G. Fedorenko. Synthesis of Titanium Dioxide: The Influence of Process Parameters on the Structural, Size and Photocatalytic.....	48
T. A. Bednaya, T. V. Semenistaya. Prediction of Functional Characteristics of Gas Sensor Based on Co-containing Polyacrylonitrile by Artificial Neural Networks.....	49
Alexander K. Belyaev, Vladimir Polyanskiy, Anatoli Polyanskiy, Yuriy Yakovlev. Constitutive Law of Non-linear Continuum with Solute Hydrogen.....	50
T.I. Belyankova, V.V. Kalinchuk, O.M. Tukodova. Peculiarities of the Surface SH-Waves Propagation in the Weakly Inhomogeneous Pre-stressed Piezoelectric Structures.....	50
G.S. Bezuglova, G.M. Chechin, I.P. Lobzenko, D.S. Ryabov. In-Plane Discrete Breathers in Deformed Graphene.....	51
E. A. Bikyashev, M. I. Tolstunov, E. A. Reshetnikova, I. O. Ryush. Effect of heterovalent doping on temperature and phase transformations in $Pb_{1-p}La_p[Zr_{0.9}Mg_{(0.1+p)/3}Nb_{(0.2-p)/3}]O_3$ solid solutions.....	52
E. A. Bikyashev, M.I. Tolstunov, E.A. Reshetnikova, I.O. Ryush. Stabilization of Unpolar Phases of the $Pb[Zr_{0.9}(Mg_{1/3}Nb_{2/3})_{0.1}]O_3$ Solid Solution.....	54
O. V. Bocharova, V. V. Kalinchuk, I. E. Andjiovich, A. V. Sedov. Investigation of the Features of the Surface Wave Fields in Media with Inhomogeneities.....	55
A. S. Bogatin, E. V. Andreev, Y. A. Ignatova, S. A. Kovrigina, V. N. Bogatina, A. L. Bulanova, I. O. Nosachev. Strong and Weak Relaxation Polarization in the Dielectric Statistical Mixtures of Unstretched Particles.....	56
A. S. Bogatin, E. V. Andreev, S. A. Kovrigina, Y. A. Ignatova, V. N. Bogatina, A. L. Bulanova, I. O. Nosachev. Strong and Weak Relaxation Polarizations: Reasons.....	57
N.A. Boldyrev, A.V. Pavlenko, L.A. Reznichenko. Dielectric Properties and Phase Transitions in Solid Solutions Based on Sodium Niobate at Cryogenic Temperature.....	58
N.A. Boldyrev, A.V. Pavlenko, L.A. Reznichenko. Obtaining, Grain Structure and Dielectric Characteristics of $PbFe_{0.5}Nb_{0.5}O_3+xMnO_2$ Ceramics.....	59



PREFACE

Advanced materials and composites, including piezoelectrics, nanomaterials, nanostructures, functional materials, polymeric composites and so on, have very importance for modern sciences, technologies and techniques. Their properties improve difficultly without intense chemical, physical, mechanical researches and development of modern numerical approaches and methods of mathematical modeling. Tremendous interest to similar investigations grows constantly, caused numerous applications and due to fast development of theoretical, experimental and numerical methods, requiring improvement of experimental equipment, theoretical and numerical approaches, computer hard- and software. These achievements create a new scientific knowledge. They allow one to understand and estimate very fine processes and transformations, occurring during processing, loading and operation of modern materials and devices under intense internal and external influences that lead to arising critical conditions and states. The modern devices and goods with sizes, changing from nano-up to macroscale ranges, possess very high accuracy, longevity and extended possibilities to operate in wide temperature and pressure ranges.

The success of the Russian-Taiwanese Symposium "Physics and Mechanics of New Materials and Their Applications", PMNM-2012 (Russia, 2012, <http://pmnm.math.rsu.ru/>), 2013 International Symposium "Physics and Mechanics of New Materials and Underwater Applications", PHENMA 2013 (Taiwan, 2013, <http://phenma.math.sfedu.ru>) and 2014 International Symposium "Physics and Mechanics of New Materials and Underwater Applications", PHENMA 2014 (Thailand, 2014, <http://phenma2014.math.sfedu.ru>) predefined objectives and scientific directions of the new conference PHENMA 2015, devoted to 100-year Anniversary of the Southern Federal University (Russia).

A significant interest to the PHENMA 2015 has led to the great sponsor support from Ministry of Education and Science of the Russian Federation, South Scientific Center of the Russian Academy of Science, Russian Foundation for Basic Research, Ministry of Science and Technology of Taiwan, New Century Education Foundation, Ocean & Underwater Technology Association, Unity Opto Technology Co., EPOCH Energy Technology Co., Fair Well Fishery Co., Formosa Plastics Co., Woen Jinn Harbor Engineering Co., Lorom Group, Longwell Co., Taiwan International Ports Co. (Taiwan), University of 17 Agustus 1945 Surabaya (Indonesia). Khon Kaen University (Thailand), Don State Technical University (Russia), South Russian Regional Centre for Preparation and Implementation of International Projects, Ltd.

The following PHENMA abstracts are divided into four scientific directions: (i) processing techniques of new materials, (ii) physics of new materials, (iii) mechanics of new materials, and (iv) applications of new materials. These are present by scientists from 20 countries, demonstrating strong scientific collaboration, formed for last years.

Symposium Chairs,

Prof. I. A. Parinov, Prof. S.-H. Chang

In the present report the degradation of polarization in the case of the long action of a high DC field was studied with the use of the parameters of the dielectric hysteresis loop on the setup, the principle of operation of which is based on the well-known Sawyer – Tower scheme at room temperature at the 50 Hz external field frequency.

The dielectric hysteresis loops of these compositions have the high values of the rectangularity coefficient of the dielectric hysteresis loop ($k_r = 0.9$), the reorientation polarization ($P_r = 35 - 37 \text{ mC/cm}^2$) and the coercive field ($E_c = 5 - 5.3 \text{ kV/cm}$). The specific volume resistance is $\rho_v = 10^{10} \Omega\text{m}$.

In composition of (1) samples, after 10^6 cycles of switching, the remanent polarization P_0 decreases by 40% that is, accompanied by the increase of the coercive field E_c by 25%.

In composition of (2) samples the process of degradation of P_0 is markedly un-favor, the decrease of P_0 after 10^7 cycles of switching does not exceed of 10%, and the changes in E_c of the samples were found to be negligible.

This evidence suggests that in the process of polarization reversal there takes place a cyclic induction of domain walls and, possibly, domain boundaries that leads to an accumulation of the defects of crystal structure. This gives rise to the formation of “frozen” domain structures leaving the switching process. It should be noted that the manifestation of the relaxor state in composition of (1) samples is higher considerable than in composition of (2) samples.

Finite Element Modeling and Analysis of Curing and Pultrusion Processes

Pavel Akishin^{1*}, Evgeny Barkanov¹, Alexey Bondarchuk²

¹*Institute of Materials and Structures, Riga Technical University, Riga, Latvia*

²*Department of Theoretical and Computational Fluid Dynamics,
Southern Federal University, Rostov-on-Don, Russia*

[*pavels.akisins@rtu.lv](mailto:pavels.akisins@rtu.lv)

Curing and pultrusion present the modern technologies for a fast production of qualitative structural components made of composite materials and applied widely in different industrial sectors such as structural, aerospace, automotive and marine engineering. Curing process is a chemical reaction (polymerization) of polymer thermoset resins. This reaction is thermally activated and exothermic in nature. The degree of cure is defined as the ratio of heat evolved during the curing process up to present time to the total heat of reaction. Traditionally the rate of reaction is approximated by two functions: Arrhenius relationship and simple resin kinetic model. The curing rate depends on the resin properties and applied temperature. Pultrusion is a continuous and efficient process producing composite profiles with a constant cross-section. During pultrusion, the fibre reinforcements are saturated with the resin in a resin tank and then continuously pulled through a heated die by a puller. Inside the die, the resin gradually cures and solidifies to form a composite part with the same cross-section profile as in the die.

Curing process is modelled with the finite element software ANSYS Mechanical examining the transient heat conduction problem. A temperature distribution is obtained for each time step and the species equation is solved outside the software using the control volume method to obtain the degree of cure at each nodal point. An effect of the convection and exothermic

terms on the temperature is computed from the known temperatures determined at the previous time step. Pultrusion process is modelled using the same algorithm, as it was developed for the curing process, adding the movement of pultruded material in the examined problem by shifting the temperature and degree of cure fields after each calculation step. Another simulation algorithm developed for the pultrusion modelling is based on the fluid dynamic finite element software ANSYS CFX. Process is analysed as transient and the cure reaction is implemented as an additional variable in this algorithm.

The developed techniques were validated by using the experimental and numerical results published in open literature and demonstrating a distribution of the temperature and degree of cure along the control line of pultruded profile. Three tests were analysed to demonstrate an application of the developed algorithms. There are pultrusion of cylindrical rod, flat plate and I-beam samples. Good agreement between present finite element results and published numerical-experimental results shows that the developed techniques can be used successfully for an accurate simulation of the curing and pultrusion processes.

Numerical and Experimental Study of Power Piezoelectric Stack Actuator for Rotorcraft Vibration Control

V.A. Akopyan¹, S.N. Shevtsov^{1,2}, I.A. Parinov¹, V.A. Chebanenko^{1*}, Jiing-Kae Wu³

¹Southern Federal University, Rostov-on-Don, Russia

²South Center of Russian Academy, Rostov-on-Don, Russia

³Department of Marine Engineering, National Kaohsiung Marine University, Kaohsiung, Taiwan

**chebanenko@sfedu.ru*

The helicopter vibrations and noise are mainly excited by periodic forces generated especially in forward flight by the main rotor due to blade vortex interaction (BVI), high Mach numbers at the advancing blade, etc. These vibrations are transferred through the rotor hub and the gearbox into the fuselage that limits the operation capability, performance, reliability, handling qualities, and efficiency of helicopters.

Among the different solutions that allow to reduce the noise and vibration levels is Individual Blade Control (IBC), where actuators independently change the aerodynamic properties of each blade in the real time. The latest kind of IBC is the active trailing edge (ATE) flap concept, where the controlled flap is localized at a distance 75 – 90% of the blade span from the rotation axis. Most often ATE concept is implemented in the form of turned discrete trailing edge flaps driven by the power piezoelectric transducers. Generally, the most important requirements to the piezoelectric actuator for the active flap design are the following. High force and large displacement of actuators should be provided in compact sizes; force actuation must be able to react operational hinge moments, and stroke actuation must be capable of $\pm 5^\circ$ of flap motion; high resolution and very short response are necessary to effectively operate under control at the higher harmonics ($> 5/\text{rev}$); the actuation mechanism must either be protected against or withstand the forces and the large strains of the blade structure.



AUTHOR INDEX

Abdulahidov K.G., 220	Magomedov M.-R.M., 124
Abramov A., 23	Mahjudin, 156
Abramova A., 23	Makariev D.I., 156, 198, 199, 218
Abramovich M.V., 170	Makarova D.N., 78
Abubakarov A.G., 24, 26, 256, 258	Makarova O.V., 176
Achmad Daengs, 27	Makhaboroda A.V., 157
Adinda Sandra Rosalinda, 156	Malachowski J., 170, 171
Agarkova D.S., 218	Malitskaya M.A., 194, 202
Agarkova M.E., 218, 219	Malyukov S.P., 132, 158, 159, 160
Ageev O.A., 27, 28, 29, 30, 31, 32, 35, 117	Manuilov M.B., 24
Ageev V. O., 33	Marakhovskiy M.A., 81
Aizikovich S.M., 199, 274	Markov A.V., 160
Akbaeva G.M., 36	Markov I. P., 110
Akishin P., 37, 47	Marysko M., 194
Akopyan V.A., 38, 207	Masloboeva S.M., 177
Alekseenko A.A., 39	McNally T., 47
Aleshin V.A., 124	Meng-Chyi Wu, 185
Alexeeva O.D., 208	Meshi B.C., 111
Alexiev A., 171, 231	Mezis M.A., 89
Aliev I.M., 26, 179	Mikhailova T.A., 191, 214
Alyoshin V.A., 125, 248	Mikhaylin I. A., 31, 32
Amenitskiy A.V., 109	Mikheykina E.B., 191
Andjikovich I. E., 55	Min-Yen Yeh, 185
Andreev E. V., 40, 41, 42, 56, 57, 106, 107, 190	Minasyan T.A., 202
Andryushin K.P., 43, 178	Miroshnichenko I.P., 161, 162
Andryushina I.N., 44, 178	Mitrin B.I., 199, 274
Anuwit Sonsiri, 44, 264	Moiseeva T. A., 163
Apinya Yaemprai, 234	Muaffaq Achmad Jani, 164
Aroonrat Punmalee, 234	Mukhin E., 143
Avakyan L.A., 191, 234	Mukhortov V.M., 195
Avilov V.I., 45	Muslimin Abdulrahim, 101, 165
Avvakumov E.G., 99	Muzyka S. S., 166
Azarov A.D., 46	Myasoedova T. N., 88, 163
Azarov D.A., 46	Nadolin D.K., 144
Badmaev B.B. , 78	Nai-Wen Hsu, 165
Bakmaev A.G., 124, 125	Nanang Sandi Wahyudi, 27
Balakirev S. V., 31, 32	Naprasnikov V., 224, 228
Baranov I.V., 225	Nasedkin A.V., 144, 166, 167, 168, 169, 173
Barkanov E., 37, 47	Nasedkina A.A., 144, 167, 170, 171
Bayan E.M., 48	Natkhin I.I., 218, 219
Bednaya T. A., 49	Nattapat Kanchanaruangrong, 238
Belenov S.V., 234	Naumenko A.A., 69, 151, 172, 173, 182, 183, 205, 206, 219



PARTICIPATING COUNTRIES AND ORGANIZATIONS

Belarus

- Department of Computer Aided Design Systems, Belarusian National Technical University, Minsk

Bulgaria

- Institute of Mechanics, Bulgarian Academy of Sciences, Sofia

China

- Beijing Jiaotong University, Beijing
- Institute of Applied Physics and Materials Engineering, Faculty of Science and Technology, University of Macau, Macau
- Kuang-Chi Institute of Advanced Technology, Shenzhen
- Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai

Czech Republic

- Institute of Physics, AS CR, Prague
- VŠB–Technical University of Ostrava, Ostrava-Poruba

France

- CNRS, CEMHTI UPR 3079, Université de Orléans, Orléans
- François-Rabelais University of Tours, Tours
- LPMC, Université de Picardie Jules Verne, Amiens

Germany

- Department of Civil Engineering, University of Siegen, Siegen
- Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin
- RheinMain University of Applied Sciences, Wiesbaden

India

- BiSS (P) Ltd, Peenya Industrial Area Bangalore
- Department of Civil Engineering, Indian Institute of Technology, Hyderabad

Indonesia

- Architecture Department, University of 17 Agustus 1945, Surabaya, East Java
- Industrial Engineering Department, University of 17 Agustus 1945, Surabaya, East Java

- Information Engineering Department, Faculty of Engineering, University of 17 Agustus 1945, Surabaya, East Java
- Mechanical Engineering Department, University of 17 Agustus 1945, Surabaya, East Java

Italy

- Department of Civil Engineering and Computer Science, University of Rome 'Tor Vergata', Rome
- Prometeon SRL, Bologna
- University of Catania, Catania
- University of Turin, Chemistry Department, NIS Centre, Turin

Latvia

- Institute of Materials and Structures, Riga Technical University, Riga

Korea

- University of Suwon, San 2-2, Wau-ri, Bongdam-eup, Hwasung-si, Gyeonggi-do

Poland

- Faculty of Mechanical Engineering, Military University of Technology, Warsaw
- International Laboratory of High Magnetic Fields and Low Temperatures, Wroclaw

Russia

- Academy of Biology and Biotechnologies, Southern Federal University, Rostov-on-Don
- AP Group LLC, Sankt-Petersburg
- Beriev Aircraft Company, Taganrog
- Branch of the St. Petersburg Hydrometeorological State University, Rostov-on-Don
- Buryat State University, Ulan-Ude
- Central Testing Facility at Rostvertol Helicopters, Rostov-on-Don
- Chechen State University, Grozny,
- Chemistry Department, Southern Federal University, Rostov-on-Don
- Crimean Federal University, Simferopol
- Don State Technical University, Rostov-on-Don
- Engineering-Technological Academy of the Southern Federal University, Taganrog
- H.I. Amirkhanov Institute of Physics of Daghestanian Scientific Center of the Russian Academy of Sciences, Makhachkala
- I.V. Tananaev Institute of Chemistry and Technology of Rare Elements and Mineral Raw Materials of the Russian Academy of Sciences, Kola Science Center, Apatity
- Institute for Mathematics, Mechanics and Informatics, Kuban State University, Krasnodar
- Institute of Problems in Mechanics, Moscow
- Institute of Complex Exploitation of Mineral Resources of the Russian Academy of Sciences, Moscow
- Institute of Management in Economic, Ecological and Social Systems, Southern Federal University, Rostov-on-Don
- Institute of Nanotechnologies, Electronics, and Electronic Equipment Engineering, Southern Federal University, Taganrog

- Institute of Nanotechnology of Microelectronics of the RAS, INME, Moscow
- Institute of Physical Materials Science RAS (Siberian Branch), Ulan-Ude
- Institute of Problem of Mechanical Engineering, RAS, St.-Petersburg
- Institute of Solid State Chemistry and Mechanochemistry SB RAS, Novosibirsk
- Institute of Technology, Don State Technical University, Azov
- Ioffe Physical Technical Institute RAS, St.-Petersburg
- IRC "Smart materials", Southern Federal University, Rostov-on-Don,
- JSC "Rubin", Moscow
- Kh. Ibragimov Complex Institute of Russian Academy of Sciences, Grozny
- Kuban State University, Krasnodar
- Kurchatov Center for Synchrotron Radiation and Nanotechnology, Russian Research Center "Kurchatov Institute", Moscow
- Laboratory of Nanomaterials, Southern Federal University, Rostov-on-Don
- Lobachevsky State University of Nizhni Novgorod, Nizhni Novgorod
- Moscow Aviation Institute, Moscow
- National Research University of Electronic Technology "MIET", MIET, Zelenograd, Moscow
- Physics Department, Southern Federal University, Rostov-on-Don
- RDC Electron and Beam Technologies, Ltd., St.-Petersburg
- Research Center for Nanoscale Structure of Matter, Southern Federal University, Rostov-on-Don
- Research Institute for Mechanics, Lobachevsky State University of Nizhni Novgorod, Nizhni Novgorod
- Research Institute of Physics, Southern Federal University, Rostov-on-Don
- Rostov State Transport University, Rostov-on-Don
- Rostov State University of Civil Engineering, Rostov-on-Don
- Scientific Design & Technology Institute 'Piezopribor', Southern Federal University, Rostov-on-Don
- Scientific-Manufacturing Complex "Technological Centre", MIET, Zelenograd, Moscow
- South Center of the Russian Academy of Science, Rostov-on-Don
- South Russian State Technical University, Novocherkassk,
- Southern Laser Innovation Technological Center, Taganrog
- St.-Petersburg State Polytechnic University, St.-Petersburg
- Institute of Management in Economic, Ecological and Social Systems, Southern Federal University, Taganrog, Russia
- Vorovich Mathematics, Mechanics and Computer Sciences Institute, Southern Federal University, Rostov-on-Don
- Yuri Gagarin State Technical University, Saratov

Taiwan

- Department of Electrical Engineering, National Taiwan Ocean University, Keelung
- Department of Electrical Engineering, National Tsing-Hua University, Hsinchu
- Department of Electronic Engineering, Cheng-Shiu University, Kaohsiung
- Department of Electrical Engineering, Hwa Hsia Institute of Technology, Taipei
- Department of Electronic Engineering, National Kaohsiung University of Applied Sciences, Kaohsiung

- Department of Information Engineering, Kun Shan University, Tainan
- Department of Marine Environmental Engineering, National Kaohsiung Marine University, Kaohsiung
- Department of Microelectronics Engineering, National Kaohsiung Marine University, Kaohsiung
- Department of Naval Architecture and Ocean Engineering, National Kaohsiung Marine University, Kaohsiung
- Department of Shipping Technology, National Kaohsiung Marine University, Kaohsiung
- Electric Communication Department, National Kaohsiung Marine University, Kaohsiung
- Institute of Electro-Optical and Materials Science, National Formosa University, Yun-Lin
- Nanoscience and Nanotechnology Center, National Chun Hsing University, Taichung
- National Taiwan University of Science and Technology, Taipei

Thailand

- Applied Engineering for Important Crops of the North East Research Group, Khon Kaen University, Khon Kaen
- Department of Agricultural Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen
- Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen
- Department of Chemical and Materials Engineering, Faculty of Engineering, Rajamangala University of Technology Thanyaburi, PathumThani
- Department of Civil Engineering, Faculty of Engineering, Thammasat University Rangsit Campus, PathumThani
- Department of Civil Engineering, Khon Kaen University, Khon Kaen
- Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok
- Department of Environmental Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen
- Department of Industrial Engineering, Faculty of Engineering, Ubonratchathani University, Ubonratchathani
- Department of Industrial Engineering, Rajamangala University of Technology Krungthep, Bangkok
- Department of Mechanical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen
- Faculty of Science and Technology, SakonNakhonRajabhat University, SakonNakhon
- Farm Engineering and Automation Technology Research Group, Khon Kaen University, Khon Kaen
 - Industrial Engineering Department, Khon Kaen University, Khon Kaen
 - Thailand Institute of Scientific and Technological Research, Technopolis, KhlongLuang, Pathumthani

Ukraine

- Institute for Problems of Materials Science, NASU, Kiev

- Kharkov National University of Radio Electronics, Kharkov
- SRC “Carat”, Lviv

United Kingdom

- Department of Mechanical Engineering, University of Bath, Bath
- School of Mechanical and Aerospace Engineering, Queen’s University Belfast, Belfast

USA

- University of Puerto Rico, San Juan, Puerto Rico

Uzbekistan

- Bukhara State University, Bukhara

Vietnam

- Department of Information Technology, Vietnam Maritime University, HaiPhong
- Department of Mechanical Engineering, Le Quy Don Technical University, Hanoi