Proceedings of the International Conference on Oxide Materials for Electronic Engineering (OMEE 2021)

September 28–October 2, 2021

Editors of the proceedings:

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WARSAW

POLISH ACADEMY OF SCIENCES
INSTITUTE OF PHYSICS

Declaration on the war launched by Russia against Ukraine on February 24, 2022, stated by the organizers of the International Scientific Conference OMEE

The organizers of the International Conference on Oxide Materials for Electronic Engineering, Fabrication, Properties and Applications (OMEE) have always considered scientific conferences as means of communication and discussion leading to expansion of scientific cooperation and civilization progress. We adhered to this position even after the beginning of Russia's aggression in Ukraine in 2014, which resulted in the illegal annexation of Crimea and the war in eastern Ukraine supported by the Russian Federation. Scientists from Russia participated in OMEE in both 2014 and 2017. On February 24, 2022, Russia started large-scale war against Ukraine. The war is unreasonable, unprovoked, and against international law and Russia's own obligations. The Russian military committed unprecedented in the 21st century inhumane atrocities and shameful crimes against the civilian population, destroying the villages and entire cities of Ukraine and their civil infrastructure. It is difficult to interpret these events otherwise than as genocide against the Ukrainians. False interpretation of these events is given by Russian politicians is why most Russians support it (see, e.g., a letter signed by six hundred rectors of Russian universities Обращение Российского Союза ректоров). All this forces the whole world to rethink these events and develop attitudes and assessments to promote peace, the preservation of world law and order, the establishment of civilizational values and justice. Therefore, the OMEE organizers declare the termination of cooperation with all representatives of government agencies, research institutions and universities of the Russian Federation until

- the illegally seized sovereign territories of Ukraine are liberated within the borders recognized by the international community,
- the illegally detained prisoners of war and deported to Russia citizens of Ukraine will be released,
- the material losses and the moral damage of the Ukrainian state and its citizens will be compensated,
- the perpetrators of the aggression will be punished for their crimes.

The OMEE Conference Organizers

Lviv Polytechnic National University, Lviv, UKRAINE
Institute of Physics of the Polish
Academy of Sciences, Warsaw, POLAND
Scientific Research Company "Electron-Carat",
Branch of Private Joint Stock
Company "Concern-Electron", Lviv, UKRAINE

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Preface

The present issue contains papers accepted to *Acta Physica Polonica A* as proceedings of the International Conference on Oxide Materials for Electronic Engineering — Fabrication, Properties and Applications (OMEE-2021). The conference was held on September 29–October 1, 2021, in Lviv, Ukraine. It was the sixth meeting in the series organized by the Lviv Polytechnic National University since 2007 in Lviv. Traditionally, the Institute of Physics of the Polish Academy of Science in Warsaw, Poland, and the Scientific Research Company "Electron-Carat" in Lviv, Ukraine, are the co-organizers of the OMEE conference.

The forum continues the good tradition of gathering experienced scientists and young researchers, as well as experimentalists and theoreticians, who work in various fields of physics, chemistry, technology and engineering, dealing with a wide variety of oxide materials and related compounds due to the diversity of their applications. The forum, therefore, enables direct and unimpeded discussions of the results and new trends in the fields, the exchange of knowledge and ideas, and joining efforts in collaboration and multidisciplinary research.

Initially, the conference was planned to be held in 2020, but the COVID 19 pandemic thwarted the plans of the organizers and forced them to postpone it twice. In 2021, the conference was finally managed to be held in a face-to-face format with partially remote participation of the keynote lecturers and on-line streaming of all sessions. At OMEE-2021, participants from 15 countries (Belarus, Estonia, Georgia, Germany, Hungary, Iran, Israel, Latvia, Poland, Portugal, Slovenia, Turkey, UK, Ukraine, USA) presented more than 140 lectures, orals presentations and posters. Some of them as papers were submitted for publication in a special issue of the *Acta Physica Polonica A* journal. All papers included in this issue have passed the standard blind peer-reviewing procedure.

We would like to thank the members of the Program Committee of OMEE-2021 and other reviewers involved in the reviewing process, who ensured the high scientific quality of the presented papers. We would also like to thank the members of the Editorial Staff of *Acta Physica Polonica A* for their efforts and enthusiasm, which made it possible to publish this issue.

S. Ubizskii, L. Vasylechko,
Ya. Zhydachevskyy,
D. Sugak, O. Buryy
Guest Editors

The Editors of *Acta Physica Polonica A* dedicate this issue to the heroes of the Ukrainian war 2022.


OMEE
Lviv – 2021
VI International Conference
Oxide Materials for Electronic Engineering – fabrication, properties and application
September 28 – October 2, 2021
Lviv Polytechnic National University, Lviv, Ukraine
Venue:
Tech Startup School, Akademika Kolessy Street, 2, Lviv, Ukraine, 79013
Conference topics:
Conference publications:
Local Organizing Committee:

Keynote Lectures

- Holger Fritze
  Technische Universität Clausthal Institut für Energieforschung und Physikalische Technologien, Goslar, Germany
  "Nonstoichiometry and Chemical Expansion of Cerium Oxide Based Thin Films"
- Nikolai Galunov
  Institute for Scintillation Materials, National Academy of Sciences of Ukraine, Kharkiv, Ukraine
  "Oxide Composite Scintillation Materials for High-Energy Radiation Detectors"
- Marek Godlewski
  Institute of Physics, Polish Academy of Science, Warsaw, Poland
  "Oxides by Atomic Layer Deposition — from Applications in Nanoelectronics to Photovoltaics"
- László Kovacs
  Wigner Research Centre for Physics, Budapest, Hungary
  "Lithium Niobate: from Single Crystals to Nanocrystals"
- Aleksandr Lushchik
  Institute of Physics, University of Tartu, Estonia
  "Characterization of Radiation-Induced Point Defects via EPR and Optical Spectroscopy in Oxides"
- Vitaliy Mykhaylyk
  Diamond Light Source Ltd.; Didcot, Oxfordshire, United Kingdom
  "Foray into Non-Contact Luminescence Cryothermometry Enabled by Oxides"
- Yevgeniy Naumovich
  The Institute of Power Engineering, Warsaw, Poland
  "Quantitative Description of Oxygen Non-Stoichiometry in Mixed Ionic and Electronic Conductors Based on a Non-Ideal Solution Approach"
- Vladimir Pankratov
  Institute of Solid State Physics, University of Latvia, Riga, Latvia
  "Luminescence Spectroscopy of Oxide Nanoparticles under Synchrotron Radiation Excitations"
- Anatoli Popov
  Institute of Solid State Physics, University of Latvia, Latvia
  "Radiation-Induced Point Defects and Processes in Ionic Oxides — Where We Are Standing Now and What We Understand Better"
- Anatoliy Senyshyn
  Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II) Technische Universität München, Germany
  "Diffraction Computed Tomography and its Applications"
- Gunnar Suchaneck
  Institut für Festkörperelektronik, Technische Universität Dresden, Germany
  "Spintronic material Sr_2FeMoO_6"
- Oleksandr Tovstolytkin
  Institute of Magnetism of the NAS of Ukraine and MES of Ukraine, Kyiv, Ukraine
  "Advanced Magnetic Nanostructures for Biomedical Applications"
- Aleksey Yaremchenko
  CICECO — Aveiro Institute of Materials Department of Materials and Ceramic Engineering (DEMAC) University of Aveiro Aveiro, Portugal
  "Thermochemical Expansion: Constraints for the High-Temperature Processing and Operation of Perovskite-Related Oxides"
- Andriy Zakutayev
  National Renewable Energy Laboratory, Golden, USA
  "Wide Band Gap Oxide Semiconductors for Electronics that Can Operate at High Temperature and High Power"
- Yuriy Zorenko
  Institute of Physics, Kazimierz Wielki University in Bydgoszcz, Poland
  "Development of Advanced Composite Scintillators and LED Converters Based on the Epitaxial Structures of Garnet Compounds"