



•INSTITUTE OF NUCLEAR AND PHYSICAL ENGINEERING, FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY,



SLOVAK UNIVERSITY OF TECHNOLOGY, BRATISLAVA • ALUMNI CLUB OF THE FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY, SLOVAK UNIVERSITY OF TECHNOLOGY, BRATISLAVA • INSTITUTE OF AUREL STODOLA, FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF ŽILINA, ŽILINA • INSTITUTE OF PHYSICS, SLOVAK ACADEMY OF SCIENCES, BRATISLAVA • SLOVAK PHYSICAL SOCIETY, BRATISLAVA



# PROCEEDINGS

of the 20<sup>th</sup> International Conference on  
**APPLIED PHYSICS OF CONDENSED MATTER (APCOM 2014)**

*June 25 – 27, 2014*

Hotel Patria, Štrbské Pleso, Slovak Republic

*Reviewed by the International Program Committee*

*Partner:*



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**EDITORS**

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The 20<sup>th</sup> International Conference on

## **APPLIED PHYSICS OF CONDENSED MATTER 2014**

is the 20<sup>th</sup> international conference in the series of events started in the year 1995 with the workshop "Solid State Physics and Radioactive Irradiation". Next three years the name of this workshop was „Effect of Non–Standard External Factors on Physical Properties of Solids“. Since 1999, its name was transformed to current name "Applied Physics of Condensed Matter" (APCOM). APCOM provides an unique opportunity for experts in the field of applied physical research of condensed matter to come together and share their visions of future development and in the area of application of devices for example in electrical and nuclear power engineering, electronic and optical communication etc. The main focus of the conference is on presentation of both theoretical and experimental results, partly also of both computer simulation results and specific measurements techniques in the investigation of physical properties and structure of bulk solids and structures, thin solid films, ultrathin organic polymer films, micro- and nanostructures *etc.*, exposed to the influence of the wide-range specific external factors (electrical, magnetic, thermal, high-frequency electromagnetic waves, optical and ionized radiation, ion and elementary particles beams and so on).

### **Main content areas:**

- 1. New materials and structures (incl. nanostructures and thin films), their analysis and specific applications*
- 2. Physical properties and structural aspects of solid materials and their influencing*
- 3. Optical phenomena in materials, photovoltaics and photonics, new principles in sensors and detection methods*
- 4. Nuclear science and technology (with emphasis on the influence of irradiation on physical properties of materials and radiation detection)*
- 5. Computational physics and theory of physical properties of matter*
- 6. Biophysics and interdisciplinary physics of condensed matter*

## 20<sup>th</sup> ANNIVERSARY OF APCOM

It was in May 1992, when the idea of Pavol Macko from the Department of Physics of FEEIT SUT came true to organize a seminar under the name "The Influence of Neutron and Gamma Radiation on the Physical Properties of Condensed Matter". The seminar was held on the premises of the Military Academy in Liptovský Mikuláš and altogether 14 lectures were presented by physicists from FEEIT SUT Bratislava, Military Academy of Liptovský Mikuláš, Slovak Academy of Science and TU Košice. Later, this seminar began to be called the zeroth edition of APCOM.

Three years later, in 1995, the same group of physicists decided to organize an international workshop under the name "Solid State Physics and Radioactive Irradiation" in Liptovský Mikuláš. This was a starting point of the next workshops and conferences. The first workshop was focused on the influence of radiation on semiconductors and metallic alloys. All contributed papers were presented orally and this rule has been kept during all the next twenty years.

A successful story of the workshop stimulated the organizers to continue on a larger scientific scale. Therefore, the second workshop was held under the name "The Effect of Non-standard External Factors on the Physical Properties of Solids". The venue was also changed to the Educational and Training Centre of the Faculty of Civil Engineering of the Slovak University of Technology in Kočovce. The results were presented as the impact of radioactive and electromagnetic radiation, beams of ionized particles and different technologies of sample preparation on the electrical, magnetic, optical and structural properties of solids.

The third workshop (1997) was also held in Kočovce and the fourth (1998) in the Hydrostav mountain hotel in Častá-Píla in a similar scientific scope.

The fifth workshop (1999) was again organized in Kočovce and was dedicated to the 80<sup>th</sup> birthday of professor Helmar Frank from Prague, the pioneer of Czech and Slovak science in the field of semiconductors.

As the scientific interests of participants began to cover a wider scope, the workshop was renamed to "Applied Physics of Condensed Matter". Starting with this year, the scientific scope of the workshop covers both theoretical and experimental results in the investigation of the physical properties of bulk solids, thin films, electronic devices, computer

simulation and measurements techniques. We also remained loyal to the influence of radiation upon the matter.

Just one month after the workshop a sad message reached us. Pavol Macko unexpectedly died. The organizers decided that the sixth workshop APCOM 2000 would be named "Mackove Kočovce" as a tribute to the deceased founder of the workshop.

In the next year the number of participants as well as of the contributed papers increased enormously and the organizers renamed the workshop to a conference and it was necessary to move the conference to a larger hall. APCOM 2001 and 2002 were organized by the physical community of Liptovský Mikuláš in the Repiská Hotel in Demänovská Valley. During these last two years the form of presentation also changed noticeably from transparencies to power-point presentation.

At this time the number of participants increased to 80 till 100 people. For the main organizers from the Faculty of Electrical Engineering and Information Technology it was difficult to organize such a big conference every year. Therefore, they made agreement with the physical community of the University of Žilina, to alternate with organization of the conference. The group of physicists from Žilina organized APCOM 2003 at Malá Lučivná in the region of Orava.

The 10<sup>th</sup> anniversary of APCOM 2004 was celebrated in the mountain hotel in Častá-Píla and APCOM 2005 and 2006 moved again to Malá Lučivná. At this time the scope of the contributed papers was so wide that it covered most areas of research in applied physics. It was also pleasant that during these years the number of young scientists and post-graduate students increased.

APCOM 2007, 2008 and 2009 were organized again in the region of Liptov in Bystrá near Liptovský Ján. The number of participants stabilized near hundred and the conference was attended by scientists from majority of institutes working in the field of applied physics, materials physics and technology in Slovakia. We also recorded an increasing number of participants from abroad.

APCOM 2010 was held in the reconstructed conference hall in Malá Lučivná and in the next years the conferences moved to the High Tatras. APCOM 2011 was held in Nový Smokovec and since 2012 the venue of the conference has been the Patria Hotel at Štrbské Pleso.

This brief history shows that APCOM has grown from a small workshop to a medium scale conference. It is an outstanding forum for experts in applied research in condensed

matter physics and offers an opportunity to meet together and to share visions of future development in materials physics and technology.

I hope that the friendly atmosphere which dominated during all preceding workshops and conferences will continue at the next APCOM conferences as well.

Bratislava, Štrbské Pleso

May-June 2014

Jozef Sitek

Chairman of the Programme Committee