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The 20th Symposium on Condensed Matter Physics

BOOK OF ABSTRACTS

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Conference presentations cover full range of research topics within the experimental, theoretical and computational condensed matter physics, including but not limited to the following:

Semiconductor physics. Electronic structure, Quantum dots and wires, Photonic crystals, High magnetic fields phenomena, Ultra-fast phenomena.

Surface, interface and low-dimensional physics. Graphene, Carbon and other nanotubes, Topological insulators, Complex oxide interfaces, Transport in nanostructures.

Magnetism. Magnetic materials and phase transitions, Magneto-electronics and spintronics, Magnetic nanoparticles.

Superconductivity. Conventional, high *T*c, and heavy-fermion superconductors: Materials and mechanisms, Heterostructures: Proximity effect and transport phenomena.

Strongly correlated and disordered systems. Materials with strong correlations and disorder, Dynamical properties from time-resolved experiments, Quantum fluids, Cold atoms and BEC.

Phase transitions, phase ordering and structural ordering of condensed matter. Equilibrium and dynamic phenomena, Ferroelectricity, Multiferroics, Quasi-Crystals, Crystal surface morphology and dynamics, Crystal growth.

Soft and biological matter. Polymers, Liquids and gels, Liquid crystals, Elastomers, Membranes, Living cells and living matter.

Statistical physics of complex systems. Networks and other structures.

Conference venue:
Serbian Academy of Sciences and Arts, Knez Mihailova 35, Belgrade

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LIST OF INVITED SPEAKERS

- Marco Aprili, PS-CNRS Université Paris-Sud, France
- Stefano Baroni, Scuola Internazionale Superiore di Studi Avanzati, Italy
- Wolfgang Belzig, University of Konstanz, Germany
- Emil Božin, Brookhaven National Laboratory, USA
- Harald Brune, Ecole Polytechnique Fédérale de Lausanne, Switzerland
- Liviu Chioncel, University of Augsburg, Germany
- Gyula Eres, Oak Ridge National Laboratory, USA
- Laszlo Forro, Ecole Polytechnique Fédérale de Lausanne, Switzerland
- Rudolf Gross, Walther Meissner Institute, Germany
- Rudi Hackl, Walther Meissner Institute, Germany,
- Igor Herbut, Simon Fraser University, Canada
- Kurt Hingerl, Johannes Kepler University, Linz, Austria
- Liv Hornekaer, Aarhus University, Denmark
- Zoran Ikonić, Univsity of Leeds, UK
- Vladimir Juričić, Nordita, KTH Royal Institute of Technology and Stockholm University, Sweden
- Milos Knezevic, Berlin Institute of Technology, Germany
- Hechang Lei, Renmin University
- Marjana Ležaić, Forschungszentrum **Jü**lich, Germany
- Zoran Mišković, University of Waterloo, Canada
- Francois Peeters, University of Antwerp, Belgium
- Axel Pelster, Technical University of Kaiserslautern, Germany
- Maria Peressi, University of Trieste, Italy
- Cedomir Petrovic, Brookhaven National Laboratory, USA
- Hyejin Ryu, Korea Institute of Science and Technology
- Milan Radović, Paul Scherrer Institute, Switzerland
- Nicolas Regnault, Ecole Normale Supérieure Paris, France
- Rastko Sknepnek, University of Dundee, UK
- Frank Steglich, MPICPfS Dresden and Zhejiang University
- Bosiljka Tadić, Jožef Štefan Institute, Slovenia
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- Dieter Vollhardt, University of Augsburg, Germany
- Rok Zitko, Jožef Štefan Institute, Slovenia
- Qingming Zhang, Lanzhou University and Institute of Physics, Chinese Academy of Sciences

Neural network based reverse-back procedure for photoacoustic electronic characterization of semiconductors

Katarina Djordjevic[a], Slobodanka Galović[b], Miroslava Jordović-Pavlović[c], Mioljub Nešić[b], Marica Popović[b], Žarko Ćojbašić[d]and Dragan Markushev[e]

[a]*University of Belgrade, Faculty of Physics, Belgrade, Serbia*
[b]*University of Belgrade, Vinca Institute of Nuclear Sciences, Belgrade, Serbia*
[c]*College of Applied Sciences Uzice, Trg svetog Save 34, Uzice, Serbia*
[d]*University of Niš, Mechanical Engineering Faculty, Niš, Serbia*
[e]*University of Belgrade, Institute of Physics, Belgrade-Zemun, Serbia*

e-mail: katarina.djordjevic@ff.bg.ac.rs

Abstract. In this paper, a procedure for determining the coefficient of ambipolar diffusion of semiconductors based on their photoacoustic response is developed. The procedure is based on the processing of the experimental response using previously designed neural network which accurately performs thermal characterization and determines the thickness of the semiconductor sample combined with a reverse-back procedure in which the theoretical model of the photoacoustic response is used, which depends on the coefficient of diffusion of charge carriers in nonlinear mode. With the parameters obtained this way, theoretical photoacoustic response is repeatedly generated and compared to the experimental signal until a satisfactory match is achieved. Experimental measurements were previously performed on Si n-type circular plates with thicknesses levels of 830 μm, 417 μm and 128 μm using a transmission minimum volume open-cell experimental set-up. The accuracy of the procedure is discussed. The coefficients obtained by this procedure show good agreement with letarture predictions.

Keywords: photoacoustic, semiconductors, artificial neural networks, thermal diffusion, thermal expansion, photothermal, inverse problem, n-type silicon, reverse-back procedure

REFERENCES

[1] Aleksić, S.M., Markushev, D.K., Pantić, D.S., Rabasović, M.D., Markushev, D.D., Todorović, D.M.: *Electro-acoustic influence of measuring system on the photoacoustic signal amplitude and phase in frequency domain*. Facta Universitatis (2016). https://doi.org/10.2298/FUPCT1601009A

[2] Popović, M. et al., "*Helmholtz Resonances in Photoacoustic Experiment with Laser-Sintered Polyamide Including Thermal Memory of Samples*," Int. J. Thermophys., vol. 37, no. 12, pp. 1–9, 2016.https://doi.org/10.1007/s10765-016-2124-3

[3] K. Lj. Djordjevic, D. D. Markushev, Ž. M. Ćojbašić, S. P. Galović, *Photoacoustic measurements of the thermal and elastic properties of n-type silicon using neural networks,* Silicon , Springer (2019) DOI: 10.1007/s12633-019-00213-6