



# **ABSTRACT BOOK**

**International research  
and practice conference:**

**NANOTECHNOLOGY  
AND NANOMATERIALS  
(NANO-2017)**

**23 - 26 August 2017  
Chernivtsi  
Ukraine**

**INTERNATIONAL RESEARCH  
AND  
PRACTICE CONFERENCE  
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**BOOK OF ABSTRACTS**

**The International research and practice conference “Nanotechnology and nanomaterials” (NANO-2017).** Abstract Book of participants of the International Summer School and International research and practice conference, 23-26 August 2017, Chernivtsi. Edited by Dr. Olena Fesenko. – Kiev: SME Burlaka, 2017. – P. 854.

This book contains the abstracts of contributions presented at the International research and practice conference “Nanotechnology and Nanomaterials” (NANO-2017).

The NANO-2017 Conference was organized by the Institute of Physics of NAS of Ukraine with the participation of the Yuriy Fedkovych Chernivtsi National University (Ukraine), University of Tartu (Estonia), University of Turin (Italy), Pierre and Marie Curie University – Paris 6 (France) and Representative office of Polish Academy of Sciences in Kiev.

NANO-2017 was the fifth conference in the series of NANO-conferences initiated by the Institute of Physics of NAS of Ukraine in 2012 in the framework of FP7 Nanotwinning project. From year to year, they attract more attention and participants. In 2012, the first meeting was held in the format of International Summer School for young scientists "Nanotechnology: from fundamental research to innovations". The 2013 and 2014 conferences were organized in conjunction with the International Summer Schools for young scientists under the same title. In 2013, this event was attended by more than 300 scientists, in 2014-2015, 450 scientists took part and in 2016 it gathered above 650 participants from Ukraine, Poland, Italy, Estonia, France, Austria, Germany, Greece, Turkey, USA, Romania, Moldova, Czech Republic, Taiwan, Lithuania, Egypt, Iran, India, Algeria, Indonesia and other countries. In 2017 Organizer Committee has received more than 700 application forms from about 25 countries of the world.

The NANO-2017 conference brought together leading scientists and young researchers from many countries of the world. This year its topics were as follows: Nanoobjects' microscopy; Nanocomposites and nanomaterials; Nanostructured surfaces; Nanooptics and photonics; Nanoplasmonics and surface enhanced spectroscopy; Nanochemistry and biotechnology; Nanoscale physics; Physico-chemical nanomaterials science.

This year the NANO-2017 Conference was organized in the framework of the NAS of Ukraine Program «Fundamental issues of creation of new nanomaterials and nanotechnologies» for 2015–2019.

Website of the Nano-2017 conference: <http://www.iop.kiev.ua/~nano2017/>

ISBN: 978-966-97587-3-6

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## Influence of cooling and heating rate on low temperature thermal conductivity of g-Ge<sub>2</sub>S<sub>3</sub>

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The Thorpe model [1] predict increasing of nanoclusters connectivity in structural matrices of chalcogenide glasses starting at mean coordination number  $z=2.4$  (As<sub>2</sub>S<sub>3</sub>). The compositional ( $z$ ) changes are influenced on thermal properties of chalcogenide glasses [2]. In [2] the low temperature thermal conductivity of g-As<sub>2</sub>S<sub>3</sub> in temperature range from 100 K to 2.5 K measured with cooling rate of 0.385 K/min and heating with rate of 0.415 K/min in the opposite direction was presented. This experiment revealed a hysteresis of  $k(T)$  above plateau located in the region of "boson peak". The highest connectivity in Ge-S glassy system is at  $z=2.8$  which corresponds to g-Ge<sub>2</sub>S<sub>3</sub>. For this glass composition during cooling and heating with rate of  $v_1=0.5$  K/min in similar temperature range as for g-As<sub>2</sub>S<sub>3</sub> the hysteresis  $k(T)$  was also detected.  $\Delta k(T)$  reproduce the density of state in a  $g(\omega)/\omega^2$  representation estimated from a Boson peak (BP) experimentally obtained by Raman measurements at room temperature.  $\Delta k(T)$  in g-Ge<sub>2</sub>S<sub>3</sub> is shifted in high energy side in comparison with  $\Delta k(T)$  of g-As<sub>2</sub>S<sub>3</sub>. It correlates with the "blue" shifting of boson maximum ( $\nu_B$ ) in g-Ge<sub>2</sub>S<sub>3</sub>,  $\nu_B = 32$  cm<sup>-1</sup> in comparison with its position in g-As<sub>2</sub>S<sub>3</sub>,  $\nu_B = 26$  cm<sup>-1</sup>. During cooling and heating of g-Ge<sub>2</sub>S<sub>3</sub> with rate of  $v_2=0.2$  K/min the difference of  $\Delta k(T)$  is small and hysteresis appears weaker. The region of "plateau" in g-Ge<sub>2</sub>S<sub>3</sub> is significantly wider and covered the temperature range from 10 to 40 K in comparison with the region of "plateau" in g-As<sub>2</sub>S<sub>3</sub> (3.6 K and 10.7 K). The increases in  $k(T)$  values in g-Ge<sub>2</sub>S<sub>3</sub> in comparison with those found in g-As<sub>2</sub>S<sub>3</sub> correlates well with the increasing of sound velocity in g-Ge<sub>2</sub>S<sub>3</sub> relating g-As<sub>2</sub>S<sub>3</sub>. Role ring correlations in random networks is discussed.

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1 *M.F. Thorpe and Y. Cai. Mechanical and Vibrational Properties of Network Structures // J. Non-Cryst. Sol. – 1989. – 114. P.19–24.*

2 *V. Mitsa, A. Feher, S. Petretskyi, R. Holomb, V. Tkac, P. Ihnatolia and A. Laver. Hysteresis of low-temperature thermal conductivity and Boson peak in glassy (g) As<sub>2</sub>S<sub>3</sub>: nanocluster contribution // Nanoscale Research Letters – 2017 – 12:345. DOI: 10.1186/s11671-017-2125-6.*