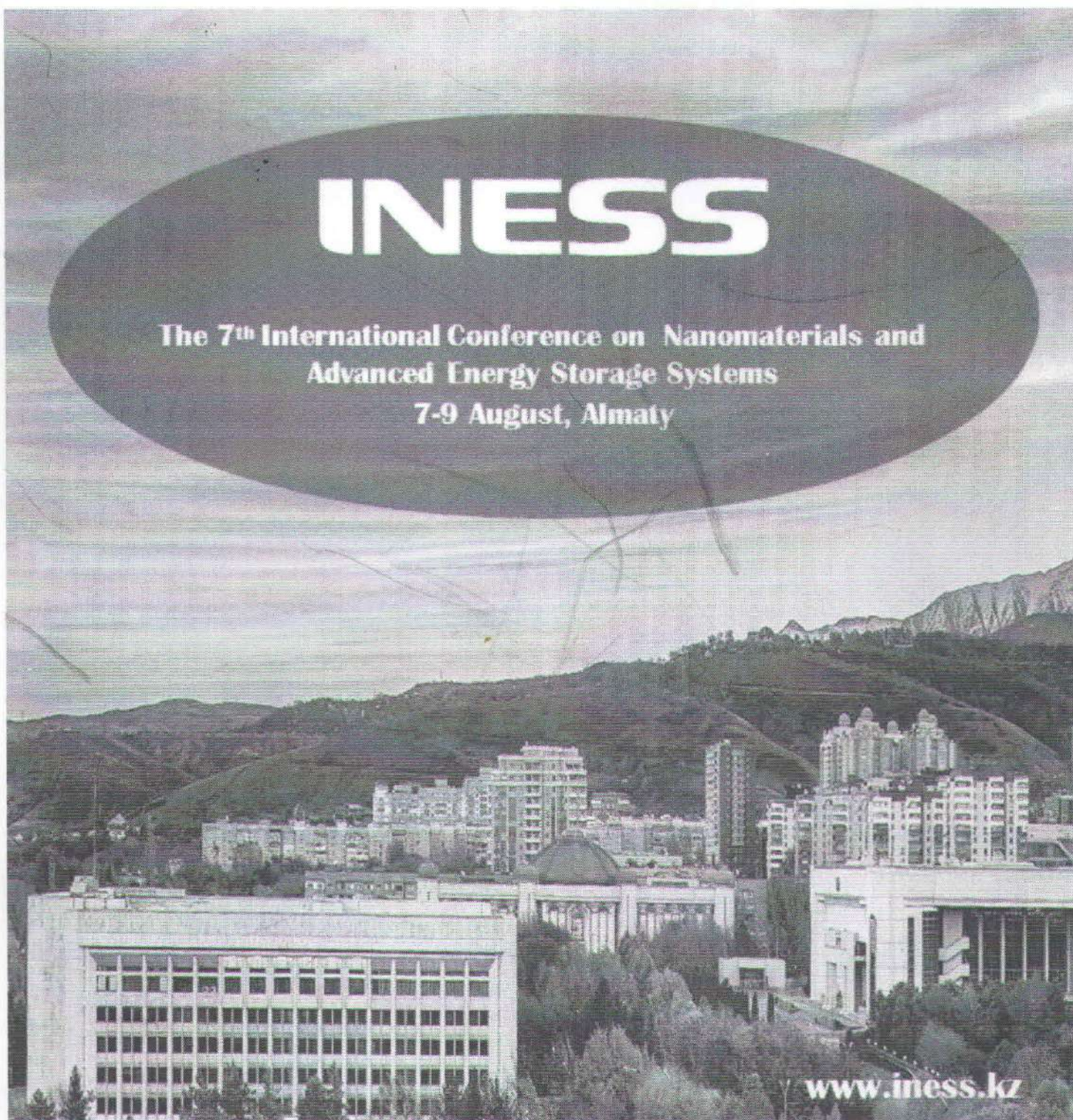




ABSTRACT BOOK

INESS

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The 7th International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS-2019)

49.	<u>Aishuak Konarov</u> , Zhumabay Bakenov, Seung-Taek Myung Activation of Oxygen Redox in P2-type Na₂/3MnO₂Compound by Incorporation of Zn ion into the Crystal Structure	59
50.	<u>S. Savilov</u> , E. Suslova, N. Osipov, E. Arkhipova, A. Ivanov, V. Lunin Determination of the Thermal Properties of Carbon Nanostructures: Experimental Approaches	60
51.	<u>D.V. Pelegov</u> , A.A. Ryabin, B.N. Slautin, A.R. Makhmutov, D.K. Kuznetsov Towards industrial quality control of LiFePO₄: Raman spectroscopy study of laser-induced decomposition	61
52.	<u>Murat Alibek</u> , Tulay Yildirim Single channel potentiostat for electroanalytical applications	62
53.	Azamat Amanzholov, Aidana Iltuzirova, <u>Salimgerey Adilov</u> Synthesis and Photophysical Properties of 5,10,15,20-tetrakis(3-cyanophenyl)porphyrin and Its Metal Derivatives	63
POSTER SESSION		
54.	<u>Berik Uzakbaiuly</u> , Azat Abdullaev, Almagul Mentbayeva, Aliya Mukanova, Zhandos Utegulov, Zhumabay Bakenov Thermal conductivity of Si thin films through time-domain thermoreflectance measurements	64
55.	<u>Yongguang Zhang</u> Construction of Oxygen-deficient La(OH)₃ Nanorods Wrapped by Reduced Graphene Oxide for Polysulfide Trapping toward High-Performance Lithium/Sulfur Batteries	65
56.	<u>Ulantai Doseke</u> , Yerzhan Mukhametkarimov, Kuanysh Dautkhan, Oleg Prikhodko, Svetlana Mikhailova, Suyumbika Maksimova, Guzal Ismailova Features of the structure and optical properties of thin TiO₂<Ag> nanocomposite coatings	66
57.	<u>Aliya Assembayeva</u> , Aleksandr Ryaguzov, Renata Nemkayeva, Nazim Guseinov, Markizat Myrzabekova Research of the structure of a-C<Pd> films by the Raman spectroscopy method	67
58.	<u>Maxim Yu. Maximov</u> , Yury Koshtyal, Ilya Mitrofanov, Ilya Ezhov, Aleksander Rymyantsev, Anatoly Popovich Features of the synthesis of lithium-based ternary oxide nanofilms by atomic layer deposition with LHMDs for thin-film LIBs	68
59.	<u>Evgeniya Il'ina</u> , Efim Lyalin, Boris Antonov Modified sol-gel synthesis of the solid electrolytes based on Li₇La₃Zr₂O₁₂ doping by Nb and Al	69
60.	A.P. Ryaguzov, <u>F. Bekmurat</u> , R.R. Nemkayeva Structure and properties of a-C <Ir> <Ir>	70
61.	<u>Nazgul Tompakova</u> , Elena Dmitriyeva, Igor Lebedev, Abai Serikkanov, Ekaterina Grushevskaya, Bagila Baitimbetova Influence of Acid Filming Solution on SnO₂ Thin Films	71
62.	<u>Almar Zhumabekov</u> , Niyazbek Ibrayev, Evgeniya Seliverstova Preparation and photoelectric characteristics of nanocomposite based on reduced graphene oxide and TiO₂	72
63.	<u>Elmira Alikhaidarova</u> , Dmitriy Afanasyev, Niyazbek Ibrayev Nanocomposite materials based on Pedot:PSS polymer mixture doped with Ag-TiO₂ and Ag-SiO₂ nanostructures	73
64.	<u>Svetlana Pershina</u> , Evgeniya Il'ina, Konstantin Druzhinin Reducing interfacial resistance between Li_{1.5}Al_{0.5}Ge_{1.5}(PO₄)₃ glass-ceramics and Li-metal anode by Al-coated	74
65.	<u>Alibek Zhakypov</u> , Suyumbika Maksimova, Oleg Prikhodko, Guzal Ismailova, Kundy Z Turmanova, Zhandos Tolepov Nanoscaled Ge₂Sb₂Te₅ films structure transformation influenced by laser irradiation	75
66.	<u>Indira Kurmanbayeva</u> , S. Kalybekkyzy, A. Mentbayeva, Z.Bakenov SiOx anodes for LIB	76
67.	<u>Nurbol Tolganbek</u> , Berik Uzakbaiuly, Almagul Mentbayeva, Kiyoshi Kanamura, Zhumabay Bakenov NASICON-type electrolyte with transition metal dopants	77
68.	<u>Yerkezhan Yerkinbekova</u> , Sandugash Kalybekkyzy, Orynbay Zhanadilov, Almagul Mentbayeva, Zhumabay Bakenov Sulfur-containing composite cathode materials for Li-Ion batteries obtained by vacuum infiltration method	78
69.	<u>Madina Kudabayeva</u> , Renata Nemkayeva, Nazim Guseinov, Alexander Ryaguzov Research of the structure and electronic properties of silicon containing amorphous diamond-like carbon films	79
70.	<u>M.F. Kadir</u> , B.E. Alpysbayeva, M.T. Yskak, M.S. Batalova Porous structures for supercapacitors	80



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Nanoscaled Ge₂Sb₂Te₅ films structure transformation influenced by laser irradiation

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Thin semiconductor films of the Ge₂Sb₂Te₅ (GST) system are successfully used in devices with phase memory (Phase Change Memory or PCM), in particular, in optical discs of various formats, such as DVD-RW and Blu-Ray. Recording information parameters depend on the structure of the films, that in turn is determined by the technology of their production.

The report presents the results of study of the transformation of nanoscaled Ge₂Sb₂Te₅ films structure with varying power and duration of laser irradiation.

Ge₂Sb₂Te₅ films with a thickness ~ 100 nm were prepared by ion-plasma high-frequency magnetron sputtering in an argon atmosphere. The structure of the films was studied *in situ* using the Raman spectroscopy method. The excitation source was a He-Ne laser with wavelength $\lambda = 633$ nm. The diameter of the irradiated area on the film was ~ 2 μ m. The laser radiation power (P_L) varied from 0.81 mW to 1.6 mW, the duration of exposure (t_L) was from 0.5 to 20 minutes. Parameters of the laser irradiation $P_L = 0.81$ mW and $t_L \leq 1$ min were selected for fixation the initial amorphous structure of Ge₂Sb₂Te₅ films.

It was found that at a minimum $P_L = 0.81$ mW and a change in t_L from 0.5 to 20 min, the structure of the films successively changes from an amorphous to polycrystalline metastable state with cubic structure (fcc), and then to stable state with hexagonal structure (hcp). At the fixed t_L and the increase in P_L from 0.5 to 1.6 mW, the structure of the films also changes from amorphous state to fcc, and then to hcp. However, at the power of 1.6 mW, fine structure is observed in the Raman spectra as the additional peaks, those is not observed in the study of kinetics. With a further increase in laser irradiation t_L , the peaks of the fine structure disappear.

Thus, the possibility of effective control the phase composition of the Ge₂Sb₂Te₅ nanoscaled films upon varying the parameters of laser irradiation was established.

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