



INESS

The 5th International Conference on Nanomaterials and Advanced Energy Storage Systems

ABSTRACT BOOK



The 4th Workshop on Water and Soil Clean-up from Mixed Contaminants



9 - 11 August, 2017
Astana, Kazakhstan



Dear Colleagues!

We greatly appreciate your participation and valuable contribution to our Conference. We are honored and pleased to welcome you at INESS-2017 and hope that you will have enjoyable time in Astana, Kazakhstan!

The Organizers will put all efforts to make these days at INESS very efficient time to exchange and discuss the ideas, establish and strengthen collaboration in various fields of research. We hope that INESS will serve as an effective platform to establish new opportunities for joint works in science and education for sustainable development and the best future.

We will be looking forward to seeing you again.

Yours sincerely,

On behalf of the Organizers,

Prof. Zhumabay Bakenov

ORGANIZERS

*Nazarbayev University,
National Laboratory Astana (NLA)
and Institute of Batteries LLC*





ORGANIZING COMMITTEE

Position - Name

Chairman - Prof. Zhumabay Bakenov

Co-Chairman - Prof. Zhaxybay Zhumadilov

Co-Chairman - Prof. Masataka Wakihara

Co-Chairman - Prof. Kiyoshi Kanamura

Co-Chairman - Prof. Yang-Kook Sun

Co-Chairman - Dr. Miroslava Vaclavikova

Co-Chairman - Prof. Desmond Adair

Co-Chairman - Prof. Moulay-Rachid Babaa

Co-Chairman - Dr. Maksym Myronov

Member - Dr. Almagul Mentbayeva

Member - Dr. Azamat Yedrissov

Member - Dr. Marat Kaikanov

Member - Dr. Anara Molkenova

Member - Ms. Zhuklyz Assylova

Member - Dr. Yerbol Sarbassov

Member - Dr. Assiya Yermukhambetova

Member - Ms. Aiyngul Kerimray

Member - Mr. Zhalgas Kulametov

Member - Mr. Dauren Batyrbekuly

Member - Ms. Ayana Sambayeva

Member - Ms. Aliya Mukanova

Member - Mr. Beisenkazi Tolegen

Member - Mr. Akylbek Adi

Member - Ms. Assylzat Aishova

Member - Ms. Aigerim Baimyrza

Member - Ms. Elzira Kenzhegaliyeva

Member - Ms. Nuriya Akhmetova

Member - Ms. Gauhar Orazbekova

Member - Ms. Assem Zharbossyn

Member - Ms. Erdigul Murat

Member - Mr. Tlek Bakenov

Member - Ms. Marzhan Moldabayeva

Member - Ms. Aidana Shotanova

Organization

School of Engineering, National Laboratory Astana, Nazarbayev University, Institute of Batteries LLP, Kazakhstan

General Director, National Laboratory Astana, Nazarbayev University, Kazakhstan

Tokyo Institute of Technology, Japan

Tokyo Metropolitan University, Japan

Hanyang University, Korea

Institute of Geotechnics of Slovak Academy of Sciences, Slovak Republic

Nazarbayev University, Kazakhstan

Nazarbayev University, Kazakhstan

University of Warwick, England

National Laboratory Astana, Nazarbayev University, Kazakhstan

National Laboratory Astana, Nazarbayev University, Kazakhstan

National Laboratory Astana, Nazarbayev University, Kazakhstan

National Laboratory Astana, Nazarbayev University, Kazakhstan

Institute of Batteries LLP, Kazakhstan

National Laboratory Astana, Nazarbayev University, Kazakhstan

Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

Nazarbayev University, Kazakhstan

Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

Institute of Batteries LLP, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

NLA, Nazarbayev University, Kazakhstan

SCIENTIFIC ADVISORY COMMITTEE

1. **Chairman** - Prof. Sung-Soo Kim, Chungnam National University, Korea

2. Prof. Zulkhair Mansurov, Al-Farabi Kazakh National University, Kazakhstan

3. Prof. Mohamed Teyeb Ould Ely

4. Prof. Jean-Pierre Pereira-Ramos, CNRS et Université Paris Est Créteil, France

5. Prof. Hirokazu Mumakata, Tokyo Metropolitan University, Japan

Prof. Seung-Taek Myung, Sejong University, Korea

SECRETARIAT OF INESS-2017

1. **Scientific Secretary** - Dr. Arulym Nurpeissova, National Laboratory Astana, Nazarbayev University, Kazakhstan

2. **Technical Secretary** - Dr. Indira Kurmanbayeva, National Laboratory Astana, Kazakhstan



AUTHORS INDEX

| | | | |
|-----------------------|--|-----------------------|--------------------|
| Abakumov Artem M. | 33 | Bouhrara Mohamed | 126 |
| Abbas Q. | 34 | Brett D.J.L. | 31 |
| Abdullin.Kh.A | 91, 92, 94, 95 | Bulatov Igor | 48 |
| Abildina Ainaz K. | 81 | Burkitbayev M.M. | 105, 109, 110 |
| Abuova Aisulu | 76, 77 | Chikhmay Ye.V | 91, 92 |
| Abuova Fatima | 76, 77 | Chung J. | 43 |
| Abuyeva B.B. | 109 | Colston Gerard | 69 |
| Adair Desmond | 52 | Cordan Anne-Sophie | 78 |
| Adi Akylbek | 32, 56, 58, 66, 67, 70 | Daemi S.R. | 31 |
| Adilov S. | 82 | Dergacheva M.B | 100, 112 |
| Adilzhan Abzal | 37 | Dichello G.A. | 123 |
| Aidarshanov Damir | 78 | Dikhanbayev Kadyrzhan | 53 |
| Aimbetov Berik | 41 | Dmitri S. Kilin | 76 |
| Aishova Assylzat | 32, 56, 57, 58, 60, 70 | Dosbolayev M.K | 98, 113 |
| Akhmetov Bakytzhan | 55 | Drozhdin Oleg A. | 33 |
| Akhmetova N. | 59, 63 | Feriancikova Katarina | 129 |
| Akilbekov Abditrash | 77 | Gabdullin M.T | 91, 92, 98, 113 |
| Alavijeh Mohammed | 123 | Galeyeva A | 84 |
| Alekseev.A | 86 | Gallios George | 119, 120, 126, 127 |
| Alikhanova Arailym | 50 | Ganesh Ingavle | 124 |
| Alikin D. O. | 30 | Ganeyev M | 61 |
| Amanzholov T | 55 | Gavryushkin Pavel | 77 |
| Amerkhanova S. | 79 | Gorshkov V.S. | 28, 64, 74 |
| Anūpov Evgeny V. | 33 | Gremenok V.F | 111, 112 |
| Arbuz Galina S | 90, 104 | Grigoryev P. S. | 64 |
| Argimbayeva Akmaral | 81 | Gritsenko. L.V | 94, 95 |
| Askarova G. | 84 | Guseinov. N.R | 95, 101 |
| Askenov Dmitry | 33 | Hara. T | 63 |
| Aukenova A | 80 | Hidehiro Sakurai | 38 |
| Babaa Moulay-Rachid | 126, 127 | Hirata N. | 43 |
| Bačik Miroslav | 121, 128 | Iakovlev Alexander | 46 |
| Bagheri Mehdi | 42 | Ibrayeva A.D. | 85 |
| Baimyrza Aigerim | 57, 60, 68 | Ilyassov .B | 86 |
| Baishagirow Khairulla | 83 | Inerbaev Talgat | 76, 77 |
| Bakdolotov Aidyn | 47 | Ingavle Ganesh | 124 |
| Bakenov Zhumabay | 27, 29, 31, 32, 35, 56, 57, 58, 59, 60, 62, 63, 65, 66, 122, 126, 127, 128 | Inglezakis Vasileios | 47 |
| Bakhytzhanyeldana G. | 81 | Ismailov D.V. | 91, 92 |
| Balanay M. | 80, 82 | Ismailov Kairat | 128 |
| Baptayev B. | 80, 82 | Itimoudis Stavros | 126, 127 |
| Bártová Zuzana | 119 | Ivaničová Lucia | 119, 121, 129 |
| Bashkirov Simon | 112 | Jaeger Martin | 52 |
| Batryshev D.G. | 113 | Jager David | 119, 128 |
| Batyrbelkuly Dauren | 69, 72 | James Alex | 37, 42 |
| Batyrkhanov Ayan | 46 | Jiang Jicheng | 24 |
| Bedilo Alexander | 40 | Jim Yongcheng | 24 |
| Béguin F. | 34 | Kadyrov S. | 44 |
| Behunova Dominika | 120 | Kaidarov Daren | 61 |
| Beisenova Gulmira S. | 81 | Kaikanov M | 96 |
| Beketayev K.B. | 107 | Kakimzhan Aldiyar | 50 |
| Belgibayeva D.S. | 106 | Kaldameyer C. | 87 |
| Bereketova G. | 84 | Kaltayev A | 55 |
| Berillo Dmitriy | 121 | Kalyeva | 88, 89 |
| Beznosko Dmitriy | 46 | Kamysbaev Duisek Kh. | 90, 104 |
| Biisenbayev M. | 34 | Kanamura Kiyoshi | 11, 13 |
| | | Kargin D.B | 85 |
| | | Karim M | 67 |
| | | Karymsakov Alikhan | 27 |





Thermal Treatment of Aluminum Doped Zinc Oxide Thin Films

Kim E. R.¹, Keldinova A. B.², Gritsenko L. V.^{1*}, Abdullin Kh. A.³, Kumekov S. E.¹

¹Kazakh National Research Technical University after K.I. Satpaev, Satpaev str., 22, Almaty, 050013 Kazakhstan

²Kazakh National University after al-Farabi, al-Farabi ave. 71, Almaty, 050000 Kazakhstan

³National nanotechnology laboratory of open type (NNLOT), Kazakh National University after al-Farabi, al-Farabi ave. 71, Almaty, 050000 Kazakhstan

E-mail: gritsenko_lv@mail.ru

Technical development is largely provided by studying of semiconductor materials and their application in electronics, telecommunications, optoelectronic devices and sensory devices¹⁻². Oxide semiconductors possess by different crystal structure and exhibit various electronic and optical properties, which provides a great potential for practical application, the possibility of realizing of new properties of these materials. Currently, transparent conductive oxide films (ZnO, SnO₂ and TiO₂) are a key component in various technologies, such as transparent electrodes for liquid crystal displays, solar cells, optical detectors, etc.³⁻⁴

It is known, that temperature treatment has a significant effect on various properties of the films, such as crystal quality, electrical behavior and photoluminescence⁵. The problem of studying the influence of the atmosphere and thermal treatment temperature on the electrical and optical properties of synthesized ZnO films is actual.

In this work, a low-cost sol-gel method for the synthesis of conductive transparent zinc oxide films doped with aluminum (AZO), which are promising for use as low-resistance conductive electrodes, has been worked out. Morphology, optical and electrical properties of AZO thin films, synthesized on glass substrates, with subsequent thermal treatment, were studied. It is shown that the synthesized AZO films are homogeneous and possess high optical transmission coefficient 70-80% in the visible range.

It is noted that the transmittance of AZO films, obtained by the sol-gel method, in the visible region decreases insignificantly at vacuum annealing. The band gap of the synthesized samples decreases with increasing annealing temperature in vacuum to 550°C from ~ 3.18 eV (from the original films) to ~ 3.02 eV.

References

- [1] Heideman R.G., Lambeck P.V., Gardeniers J.G.E. // *Journal of Optical Materials*. 1995. – Vol. 4. – P. 741–755.
- [2] Hsin-Ming Cheng, et al. // *J. Phys. Chem.* – 2008. – Vol. 112, Issue 42. – P. 16359.
- [3] Clatot J., Campet G., Zeinert A., Labrugère C., Nistor M., Rougie A. // *Solar Energy Materials and Solar Cells*. – 2011. – Vol. 95, Issue 8. – P. 2357–2362.
- [4] Fortunato E., et al. // *Thin Solid Films*. – 2004. – Vol. 451–452. – P. 443–447.
- [5] LinhuaXu, Gaig e Zheng, Min Lai, Shixin Pei. // *Journal of Alloys and Compounds*. – 2014. – Vol. 583. – P. 560–565.