

## Report to APDIC, June 2023

### Activities of Members of Ukrainian Phase Diagrams and Thermodynamics Commission, Ukraine

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### Short Information about the Meetings held in 2022

8<sup>th</sup> International Samsonov Conference "Materials Science of Refractory Compounds" (MSRC-2022) was held from 24<sup>th</sup> to 27<sup>th</sup> May, 2022 in Kyiv.

The Conference was organized by Frantsevich Institute for Problems of Materials Science of NASU (FIPMS; Kyiv, Ukraine) and National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" under patronage of Ukrainian Materials Research Society (UMRS).

The main topics of the Conference were:

- The electronic structure and properties of refractory compounds.
- Synthesis of refractory compounds, chemical properties, phase diagrams.
- Low-dimensional nanostructures of refractory compounds.
- Films and coatings based on refractory compounds.
- Ceramics and composites based on refractory compounds.

**All-Ukrainian Scientific and Technical Conference "Наука і металургія" ("Science and Metallurgy")** was held from 22<sup>nd</sup> to 24<sup>th</sup> November, 2022 in Dnipro.

The Conference was organized by Iron and Steel Institute of Z.I. Nekrasov of NASU and Ukrainian State University of Science and Technologies of the Ministry of Education and Science of Ukraine (Dnipro, Ukraine).

The main topics of the Conference were:

- Iron and steel metallurgy: technologies, innovations, quality;
- Electrometallurgy;

– Automation and modern methods of controlling metallurgical processes and the quality of metallurgical products;

– Metal science and heat treatment of steel;

– Progressive metal processing technologies;

– Modelling and optimization of technological processes;

– Environmental problems of ferrous metallurgy

**The Organizations and Investigators in the Field of Phase Diagrams,  
Thermodynamics and Crystal Structures in Ukraine  
Presented their Results in the 2023 year Report  
of Ukrainian Phase Diagrams and Thermodynamics Commission**

Organization	Persons	Field of Interests
<p><i>Frantsevich Institute for Problems of Materials Science (National Academy of Sciences of Ukraine, Kyiv)</i></p> <p><i>Department of Physical Chemistry of Inorganic Materials</i></p>	<p><b>Team Leader</b> <b>Dr.Sc. A. Bondar</b></p> <p>Prof. Dr.Sc. V. Sudavtsova Dr.Sc. M. Bulanova Dr.Sc. J. Fartushna Ph.D. K. Korniyenko Ph.D. O. Myslyvchenko</p>	<p>Alloy phase diagrams and thermodynamics of the metallic alloys</p>
<p><i>Physical Chemistry and Refractory Oxides Technology Department</i></p>	<p><b>Team Leader</b> <b>Dr.Sc. O. Dudnik</b></p> <p>Dr.Sc. S. Lakiza</p>	<p>Phase diagrams of the ceramic systems</p>
<p><i>Department of Functional Ceramics Based on Rare Earths</i></p>	<p><b>Team Leader</b> <b>Dr.Sc. O. Kornienko</b></p>	<p>Phase diagrams of the ceramic systems based on rare earths</p>
<p><i>Donbas State Engineering Academy (Ministry of Education and Science of Ukraine, Kramatorsk)</i></p> <p><i>Laboratory of Physico-chemical Properties of Metallic Liquid Alloys</i></p>	<p><b>Team Leader</b> <b>Prof. Dr.Sc. M. Turchanin</b></p> <p>Dr.Sc. P. Agraval Ph.D. L. Dreval Ph.D. A. Vodopyanova</p>	<p>Thermodynamics of phases and phase diagrams</p>

Organization	Persons	Field of Interests
<p><i>Taras Shevchenko National University of Kyiv (Ministry of Education and Science of Ukraine, Kyiv)</i></p> <p><i>Department of Physical Chemistry</i></p>	<p><b>Team Leader</b> <b>Prof. Dr.Sc. O. Roik</b></p> <p>Prof. Dr.Sc. V. Kazimirov Dr.Sc. V. Sokol'skii Ph.D. N. Usenko Ph.D. N. Kotova Ph.D. N. Golovataya Ph.D. O.Yakovenko</p>	<p>Structure and thermodynamics of metallic alloys</p>

	Contact Persons:
<p><b>EP</b> Experimental, Phase Diagram</p> <p><b>ET</b> Experimental, Thermodynamic</p> <p><b>CA</b> Computational Atomistics</p> <p><b>CT</b> Computational Thermodynamics</p> <p><b>ICE</b> Intellectual Critical Evaluation of All Published Data</p> <p><b>X</b> work in progress</p> <p><b>F</b> finalized in the reporting period</p> <p><b>P</b> planned for the current year</p>	<p>Pavel Agraval &lt;pagraval68@gmail.com&gt;</p> <p>Anatolii Bondar &lt;aa_bondar@ukr.net&gt;</p> <p>Marina Bulanova &lt;mvbulanova2@gmail.com&gt;</p> <p>Liya Dreval &lt;liya.dreval@gmail.com&gt;</p> <p>Elena Dudnik &lt;dudnikelena@ukr.net&gt;</p> <p>Julia Fartushna &lt;juliefart81@gmail.com&gt;</p> <p>Oksana Kornienko &lt;kornienkooksana@ukr.net&gt;</p> <p>Kostyantyn Korniyenko &lt;korniyenkok@ukr.net&gt;</p> <p>Oleksandr Myslyvchenko &lt;zvyagina47@gmail.com&gt;</p> <p>Oleksandr Roik &lt;roikoleksandr1978@gmail.com&gt;</p> <p>Valentyna Sudavtsova &lt;sud.materials@ukr.net&gt;</p> <p>Mykhailo Turchanin &lt;<a href="mailto:mikhailturchanin@gmail.com">mikhailturchanin@gmail.com</a>&gt;</p> <p>Natalia Usenko <a href="mailto:nusenko@univ.kiev.ua">nusenko@univ.kiev.ua</a></p> <p>Tamara Velikanova &lt;velscience55@gmail.com&gt;</p>

System	EP	ET	CA	CT	ICE	Contributor	Comment
Al-C-Ca-Co-Cr-Cu-Fe-Mn-Mo-N-Nb-Ni-P-S-Si-V-W	X					[22Syd]	Ph.D. O. Myslyvchenko phase composition of forged steel with regulated austenite transformation
Al-C-Fe					F	[22Tym]	Dr.Sc. A. Bondar in collaboration with MSI
Al-Ce-O-Y-Zr						[22Smy]	Dr.Sc. O. Dudnik structure and phase composition of ultrafine Al <sub>2</sub> O <sub>3</sub> -ZrO <sub>2</sub> -Y <sub>2</sub> O <sub>3</sub> -CeO <sub>2</sub> powders
Al-Co-Cr-O-Y-Zr	X					[22Gre]	Dr.Sc. O. Dudnik formation, structure, chemical and phase composition of thermal-barrier coatings
Al-Co-Sn	X		X			[22Roik]	Dr.Sc O. Roik High-temperature X-ray diffraction and reverse Monte Carlo simulations
Al-Cr-Fe					F	[22Kor4]	Ph.D. K. Korniyenko in collaboration with MSI
Al-Cr-Ni-O-Y-Zr	X					[22Gre]	Dr.Sc. O. Dudnik formation, structure, chemical and phase composition of thermal-barrier coatings
Al-Cr-Ti	F					[22Kor3]	Ph.D. K. Korniyenko phase diagram in the range 45–100 at. % Al
Al-Cu	X		X			[22Kas]	Dr.Sc O. Roik High-temperature X-ray diffraction and molecular dynamic simulations
Al-Fe-Ni					F	[22Cac]	Ph.D. L. Dreval in collaboration with MSI
Al-Fe-O					F	[22Kub]	Ph.D. L. Dreval in collaboration with MSI
Al-Fe-P					F	[22Sch]	Ph.D. L. Dreval in collaboration with MSI I
Al-Fe-Si					F	[22Li]	Prof. Dr.Sc. M. Turchanin in collaboration with MSI
Al-Fe-Ta					F	[22Bon]	Dr.Sc. A. Bondar in collaboration with MSI

System	EP	ET	CA	CT	ICE	Reference	Comment
Al-Fe-Ti					F	[22Ste]	Ph.D. K. Korniyenko in collaboration with MSI
Al-Fe-V					F	[22Kor5]	Ph.D. K. Korniyenko in collaboration with MSI
Al-Mg	X		X			[22Kir]	Dr.Sc O. Roik High-temperature X-ray diffraction and reverse Monte Carlo simulations
Al-Ni-Sn	X		X			[22Yak]	High-temperature X-ray diffraction and reverse Monte Carlo simulations
Ce-Dy-La-O	F					[22Kor1]	Dr.Sc. O. Kornienko isothermal section of the CeO <sub>2</sub> -La <sub>2</sub> O <sub>3</sub> -Dy <sub>2</sub> O <sub>3</sub> system at 1500°C
Ce-Ho-La-O	F					[23Kor2]	Dr.Sc. O. Kornienko isothermal section of the CeO <sub>2</sub> -La <sub>2</sub> O <sub>3</sub> -Ho <sub>2</sub> O <sub>3</sub> system at 1500°C
Ce-La-O-Yb	F					[22Kor3]	Dr.Sc. O. Kornienko isothermal section of the CeO <sub>2</sub> -La <sub>2</sub> O <sub>3</sub> -Yb <sub>2</sub> O <sub>3</sub> system at 1500°C
Co-Fe-Ho	F					[22Far2]	Dr.Sc. J. Fartushna Dr.Sc. M. Bulanova phase diagram
Co-Hf-Ti		F		F		[22Tur1]	Prof. Dr.Sc. M. Turchanin Mixing enthalpy of liquid alloys and temperature- composition dependence of thermodynamic mixing functions
Co-Ho	F					[22Far2]	Dr.Sc. J. Fartushna Dr.Sc. M. Bulanova phase diagram
Cu-Hf-Ti				F		[22Tur1]	Prof. Dr.Sc. M. Turchanin Temperature- composition dependence of thermodynamic mixing functions
Cu-Ti-Zr	F					[22Sto]	Dr.Sc. M. Bulanova phase equilibria in the Ti-CuTi <sub>2</sub> -CuZr <sub>2</sub> -Zr region
Cu-Yb		F		F		[22Dud1]	Prof. Dr.Sc. V. Sudavtsova isoperibolic calorimetry calculation of liquidus curve (ideal associated solution model)
Dy-La-O	F					[22Kor2]	Dr.Sc. O. Kornienko phase diagram of the La <sub>2</sub> O <sub>3</sub> -Dy <sub>2</sub> O <sub>3</sub> system

System	EP	ET	CA	CT	ICE	Reference	Comment
Fe-Hf-Ni		F		F		[22Dre1]	Ph.D. L. Dreval Mixing enthalpy of liquid alloys and temperature-composition dependence of thermodynamic mixing functions and chemical ordering in liquid alloys
Fe-Hf-Ni				F		[22Tur2]	Prof. Dr.Sc. M. Turchanin Temperature-composition dependence of thermodynamic mixing functions
Fe-Ni-Ti				F		[22Tur2]	Prof. Dr.Sc. M. Turchanin Temperature-composition dependence of thermodynamic mixing functions
Fe-Ni-Zr		F		F		[22Dre2]	Ph.D. L. Dreval Mixing enthalpy of liquid alloys and temperature-composition dependence of thermodynamic mixing functions
Fe-Ni-Zr				F		[22Tur2]	Prof. Dr.Sc. M. Turchanin Temperature-composition dependence of thermodynamic mixing functions
Ni-Hf-Ti				F		[22Tur1]	Prof. Dr.Sc. M. Turchanin Temperature-composition dependence of thermodynamic mixing functions
Hf-O-Sm-Zr	F					[22Yur]	Dr.Sc. O. Kornienko isothermal section of the $ZrO_2$ - $HfO_2$ - $Sm_2O_3$ system at 1500°C

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