

MIHAI-IONUT STURZA

Postdoctoral Appointee

Leibniz Institute for Solid State and Materials Research (IFW)

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RESEARCH

The main aim of my work is to synthesize new inorganic compounds (new oxides, oxohalides, pnictides, chalcogenides, intermetallics.....) and to correlate their chemical and physical properties to their compositions and crystal structures. Discovery and design of new enabling materials is one of the key, cross-cutting research areas called for in every energy-related basic science challenge.

My research at IFW involves searching for novel low-dimensional materials with interesting electronic properties emerging from a competition between different electronic states or a suppression of the electronic order (charge, orbital or spin). This ambitious collaborative research will generate: a) new insights in controlling structural/electronic instabilities in complex materials, b) new synthesis and crystal growth techniques for advanced electronic materials, and c) Fermi surface tuning accompanied by judicious doping which may drive the phase from a normal state to a metallic or a superconducting state.

In addition to the various experience in the field of synthesis, my investigations are based on a broad and complementary range of methods for thorough sample characterization combining standard methods such as powder/single crystal X-ray/neutron/synchrotron diffraction versus temperature, scanning and transmission electron microscopy (SEM, TEM), electron backscattering diffraction (EBSD), thermal analyses and measurement of electrical properties and analysis of the corresponding data including basic techniques as measurement of the magnetization, resistivity and heat capacity. The structural feature of the new synthesized materials is investigated using single crystal X-ray diffraction (SC-XRD), X-ray and neutron powder diffraction (XRPD and NPD). I have extensive experience in solving, refining a large number of crystal structures.

EDUCATION AND EXPERIENCE

2015 – to date: Postdoctoral Researcher in Synthesis and Crystal Growth.

IFW Institute for Solid State Research, Synthesis and Crystal Growth Research Team, Materials Development Group, Dresden, Germany.

→ Supervisor: Dr. S. WURMEHL and Dr. S. ASWARTHAM- research group leaders

→ My research involves searching of novel materials with interesting electronic properties emerging from a competition between different states or suppressed electronic order. We propose to discover novel materials by carefully targeting either structural or electronic motifs that appear to be fertile areas in which we can apply our expertise in solid-state synthesis/crystal growth.

Curriculum vitae

2011 – 2014: Postdoctoral Appointee in Solid State Chemistry

Argonne National Laboratory, Material Science Division, Emerging Materials Group, Argonne, IL, USA

→Supervisor: MERCOURI G. KANATZIDIS - Charles E. and Emma H. Morrison Professor, Department of Chemistry, Northwestern University and Senior Scientist Argonne National Laboratory, Materials Science Division, Argonne, IL.

→ My research involved the investigation of superconductivity in: (a) two-dimensional compounds with square lattices exhibiting competing interactions (pnictides and chalcogenides); (b) narrow gap semiconductors chalcogenides. Developing the exploratory synthesis of metal chalcogenides and pnictide phases.

2008 – 2011: PhD. in Solid State Chemistry

Science and Technology University of Lille1, UCCS UMR8181 Laboratory, France

→Supervisor: OLIVIER MENTRE - Research Director at CNRS in Solid State Chemistry

→PhD thesis “Iron oxyfluoride with a perovskite-type structure: influence of anionic subarray on the crystal structure and physicochemical properties”. The aim of thesis was to prepare new inorganic compounds (most of the times, using partial incorporation of fluoride in perovskite-related compounds) and to correlate their chemical and physical properties to their compositions and crystal structures. For instance, F⁻ anions were introduced in order to rationally create labile defected structure with probable instability in favor of low-temperature reactivity with oxygen. In the meantime, the magnetic exchanges in these modified compounds are strikingly reinforced through the local structural rearrangements.

2004 – 2006: Master’s Degree in Environmental Chemistry

“Alexandru Ioan Cuza” University of Iasi, Faculty of Chemistry, Romania

→Supervisor: Dr. KARIN POPA, Associate Professor

→M. Sc thesis: “The retention of radioactive ions on adsorbents resistant in acid”. The aim of my research is to study the environmental radionuclide pollution, especially, of the uranium and thorium series and ¹³⁷Cs.

2000 – 2004: B.Sc Degree in General chemistry primarily focused on radiochemistry

“Alexandru Ioan Cuza” University of Iasi, Faculty of Chemistry, Romania

→Supervisor: Prof. Dr. ALEXANDRU CECAL

→B. Sc Thesis: “Chemical solubilisation of the uranium ores”.

1996 – 2000: “Dimitrie Cantemir” College of Iasi, Romania

TRAINING

June 2020 – Rigaku School For Practical Crystallography (*online*)

April 2017 –32nd Ad Hoc Workshop on Jana2006 – Basics of Jana2006 and modulated structures, Institute of Physics, Praha, Czech Republic.

March 2017 – 9th Workshop on Structural Analysis of Aperiodic Crystals, University of Bayreuth, Germany

May 2016 – 9th ILL Annual School on Neutrons diffraction Data treatment using FullProf Suite - aims to contribute to the training of scientists in treatment of X-ray and neutron diffraction data.

Curriculum vitae

March 2015 – 8th Workshop on structural analysis of aperiodic crystals - provide an overview of the methods of structural analysis of incommensurately modulated crystals and composite crystals.

September 2009 – “Summer European School on Magnetism 2009 - Models in magnetism from basic aspects to practical uses” September 1-10th 2009, Timisoara, Romania.

June 2005 – “Summer school on Actinide Science and Applications” Institute for Transuranium Elements, Karlsruhe, Germany.

EMPLOYMENT HISTORY

November 2014 – present Postdoctoral Researcher (with my own Funding 2016-2020)
IFW Institute for Solid State Research, Synthesis and Crystal Growth Research Team, Materials Development Group, Dresden, Germany.

→ Researcher in Synthesis and Crystal Growth of novel low-dimensional materials

December 2011 – November 2014 Postdoctoral Appointee

Argonne National Laboratory, Material Science Division, Emerging Materials Group, Argonne, IL, USA

→ Researcher in solid state chemistry

October 2008 – October 2011 PhD researcher

Science and Technology University of Lille1, Cite Scientifique, 59655 Villeneuve D'Ascq, France

→ Teaching and student supervision (tutorial and research training courses)

June 2006 – October 2008 Chemical process technician at “Proinstal Grup” 700506 - Iasi, Romania

→ Monitor production process of equipment made from polyester (LDPE and HDPE), conditions and control systems if required.

TECHNICAL SKILLS

→ Extensive experience in inorganic materials (thermoelectric, alloys, intermetallic, semiconductors and superconductors) syntheses, material optimization, doping techniques, annealing, sintering, solid solutions, handling of air-sensitive materials, working with high purity metals and chemicals.

→ Strong expertise in property measurements and structural characterization of inorganic materials: Magnetic Susceptibility (SQUID, VSM, PPMS), Electrical Conductivity and Seebeck Coefficient (ULVAC ZEM-3, Four-probe), Impedance Spectroscopy (ionic, MIEC), Thermal Conductivity (Netsch LFA), Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS), Differential Thermal Analysis (DTA), Thermal Gravimetric Analysis (TGA), FT Infra-Red (FTIR) Spectroscopy and Diffuse Reflectance Ultraviolet-Visible (UV-Vis) Near-IR Spectroscopy.

→ Experience in X-ray crystallography and powder diffraction. Three years of experience with Panalytical X'pert Pro MPD with an Anton Parr. Five years of experience with STOE IPDS 2T and Bruker APEX II.

→ Experience in solving and refining of various inorganic, organic and organometallic crystal structures with the aid of wide range of software for structure

Curriculum vitae

solution, refinement, visualization - Unix, Macintosh and PC platforms (SHELXTL, TOPAS, JANA, JADE, VESTA, ATOMS, CRYSTALMAKER, DIAMOND, FULLPROF, GSAS, EVA, CMPR, CHECK CELL, POWDER CELL).

→ Proficiency in Microsoft Programs (Excel, PowerPoint, Word) and Origin.

→ Use, maintenance and repair of laboratory equipment (dry boxes, vacuum pumps, sealing lines, furnaces, etc.)

SOCIAL & ORGANISATIONAL SKILLS AND COMPETENCES

→ Good social skills, good ability to adapt to multicultural environments, gained through my work experience abroad.

→ Team spirit, creating and keeping deadlines, delegation.

→ Goal setting and meeting goals.

→ Decision making, managing appointments, making schedules.

→ Team management, Project management.

LANGUAGE SKILLS

→ **Romanian:** mother tongue;

→ **English:** fluent spoken and written;

→ **French:** fluent spoken and written.

RESEARCH PROJECTS

➤ *as principal investigator:*

2016 – DFG temporary positions “Rational synthesis of novel low-dimensional materials by tuning of Fermi level via chemical doping”

➤ *as part of the project team:*

2015 – “Correlated Magnetism: From Frustration to Topology” (SFB 1143).

2014 – “Synthesis and crystal growth of new and well-established iron pnictide superconductors” (SPP 1458)

2011-2014 – “Rational Synthesis of Superconductors” (FWP 70053)

OTHER EXPERIENCE

➤ Teaching (2008-2011): Inorganic and general Chemistry, *Science and Technology University of Lille1* (64 hour/year of labs and classes during PhD).

➤ Trained an undergraduate student (March - June 2009) - Solid state synthesis and characterizations of mixed oxide transition metal.

➤ Supervision of master student (July - December 2015) – Crystal Growth of Rhenates and Osmates.

➤ Participation at different activities in the department of chemistry and material science at Argonne National Laboratory, USA.

➤ Reviewer of specialized journals: Central European Journal of Chemistry and Journal of Solid State Chemistry.