Andrei Tkachuk

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Birth Date: November 18, 1972

Citizenship: Ukraine
Marital status: Married

EDUCATION:

Argonne National Laboratory, Argonne, Illinois, USA
Present — Postdoctoral Appointment
Advanced Photon Source, X-ray Microscopy Group
Emphasis: Full field X-ray diffraction imaging and microdiffraction

University of Illinois, Urbana-Champaign, Illinois, USA
2002 — Ph.D. in Materials Science & Engineering,
Thesis adviser: Prof. Haydn Chen
Thesis focus: Synchrotron X-ray studies of complex ferroelectric oxides

Northern Illinois University, Dekalb, Illinois, USA
1997 — M.S. in Solid State Physics
Thesis adviser: Distinguished Prof. Clyde Kimball
Thesis focus: Mossbauer studies of colossal magnetoresistance oxides

Northern Illinois University, Dekalb, Illinois, USA
1994 — B.S. in Physics

Chernovtsy State University, Ukraine
1989-1993 — Undergraduate Studies in Physics
Emphasis: Optoelectronic devices

RESEARCH EXPERIENCE:

Argonne National Laboratory, Argonne, Illinois, USA, 2002-
Postdoctoral Appointment at Advanced Photon Source (APS), X-ray Microscopy

- Conducted scientific research both as principle investigator and collaborator in various fields of materials science and solid state physics using synchrotron x-rays and neutrons.
- Took leading role in development of x-ray diffraction imaging scientific program at 2BM beamline.
- Designed and developed instrumentation for x-ray microscope at 2BM
- Developed data acquisition and data analysis software that significantly improved user productivity.
- Coordinated and assisted general users with planning, design and conduction of their experiments at 2BM beamline on 24 hour working shift

system.

Argonne National Laboratory, Argonne, Illinois, USA, 1998-2002
Resident graduate student at APS, UNICAT, Sector 33

- Developed a solid experimental and theoretical background in the field of synchrotron x-ray science.
- Made significant contributions to the assembly and development of 33-ID and 33-BM state of the art synchrotron beamlines.
- Acquired professional skills with ultra high vacuum, cryogenics, electronics, computer networking, robotics and remote computer hardware control.
- Collaborated in projects outside of thesis research.
- Assisted and trained other users in beamline usage and operation.

Max-Plank Institute fur Metallforschung, Stuttgart, Germany. Summer '01
Summer Assistantship in the Prof. Helmut Dosch x-ray research group

- Collaborated in studies of colossal magnetoresistance thin films and ferroelectrics with hard x-rays at HASYLAB Petra 2 beamline, Hamburg, Germany.
- Performed upgrades to laboratory rotating anode system.
- Contributed to the development of Max-Plank institute's beamline at the ANKA Synchrotron, Karlsruhe, Germany.

National School on Neutron and X-ray Scattering, Argonne, IL, USA Summer '99

- Completed the course of lectures taught by the leading scientists on the experimental and theoretical aspects in the field of x-ray and neutron scattering.
- Acquired hands-on experience on various experimental x-ray and neutron techniques at Advanced Photon Source (APS) and Intense Pulsed Neutron Source (IPNS) at Argonne National Laboratory.

Advanced Photon Source (APS), Argonne, IL, USA Summer '98
Summer job in development of UNICAT Sector 33 ID beamline at APS

- Acquired an extensive training in operation and maintenance of complex beamline instrumentation.
- Contributed to design, installation and integration of various beamline components.

University of Illinois, Urbana-Champaign, Illinois, USA 1997-1998
Graduate research assistant, Department of Materials science & Engineering

- Designed and conducted experiments in various state-of-the–art synchrotron facilities around the world.
- Managed and serviced x-ray laboratory.
- Upgraded an outdated software and motion control hardware on the four circle single crystal diffractometers.
- Significantly improved performance and stability of the 18 kW Rigaku rotating anode x-ray generator.

- Taught and supervised Microstructure and Characterization laboratory course for senior undergraduate students.

MSD division, Argonne National Laboratory, Argonne, Illinois, USA 1996-1997
Master's Thesis Graduate Research, Materials Science Division (MSD)

- Used Mossbauer spectroscopy as a local probe technique to study colossal magnetoresistance oxides doped with traces of ^{57}Fe isotope.
- Closely worked with Dr. Bob Dunlap (former director of MSD) and other Argonne scientists on data analysis and interpretation during M.S. thesis research at Northern Illinois University.

Northern Illinois University, Dekalb, Illinois, USA 1994-1997
Research and Teaching Graduate Assistantship

- Managed Mossbauer spectroscopy laboratory at Physics Department.
- Developed software for analysis of the Mossbauer data which took into account dynamic spin relaxation phenomena and distribution of the magnetic hyperfine fields.
- Performed numeric simulations and visualization of the experimental Mossbauer results with animations.
- Trained new graduate students in data acquisition and analysis.
- Tutored and graded Electrodynamics graduate level course taught by Dr. George Crabtree over a period of several semesters.

COMPUTER SKILLS:

- Knowledge of all major operating systems and computer platforms: UNIX; MS-Windows operating systems.
- Practical programming skills in data analysis with C; Python; FORTRAN; *Mathematica*; and *Igor Pro* data analysis software.
- Developed dynamic websites for X-ray microscopy group using PHP, Python, Perl and mySQL database server technologies.
- Knowledge of computer hardware for data acquisition.
- Proficient in SPEC diffraction data acquisition software.
- Wrote various EPICS beamline control applications.

EXPERIMENTAL SKILLS AND TECHNIQUES:

- Full field diffraction imaging, microdiffraction and topography.
- Single crystal high resolution crystallography, Powder Diffraction, DAFS.
- Diffuse x-ray and neutron scattering.
- Mossbauer spectroscopy and inelastic nuclear resonant scattering.

MAIN RESEARCH INTERESTS:

1) In-situ studies of ferroelectric domain growth kinetics in ferroelectrics by real time x-ray microscopy techniques.
2) Development of full field x-ray microscope with submicron spatial

resolution.

3) High throughput characterization of combinatorial samples with x-ray microdiffraction techniques.
4) Colossal magnetoresistance in magnetic transition metal oxides for magnetic memory storage devices.
5) Relaxor ferroelectrics and their applications in nonvolatile memory devices.
6) X-ray scattering surface studies of CO monolayers on Pt for catalytic applications in gas sensors and fuel cells.
7) In-situ growth and studies of magnetic and ferroelectric oxide films.

EDITORIAL ACTIVITIES:

- Ad Hoc Editorial Consultant,
  Materials Chemistry and Physics, 2001
  APS peer review for Physical Review B, 2004

PUBLICATIONS:

*F. Tsui, L. He, **Tkachuk A.**, S. Vogt, Y.S. Chu, Evidence for strain compensation in stabilizing epitaxial growth of highly doped germanium, PHYSICAL REVIEW. B **69**, 081304(R) (2004)*

Tkachuk, A., P.M. Gehring *and H. Chen, Neutron Studies of Anti-ferrodistortive Nanodomains in PMN. (in preparation for publication)*

*A. Menzel, Y. V. Tolmachev, V. Komanicky, **Tkachuk A.**, Y.S. Chu, and H, You, Surface X-ray Scattering Studies of (2x2)-3CO Monolayer on PT(111), (to be published in PHYSICAL REVIEW LETTERS)*

*Y. V. Tolmachev, A. Menzel, **Tkachuk A.**, Y. S. Chu, and H. You, In-Situ Surface X-Ray Scattering Observation of Long-Range Ordered (√19x√19)R23.4°-13CO Structure on Pt(111) in Aqueous Electroytes, ELECTROCHEMICAL AND SOLID-STATE LETTERS, **7** 3E23-E26 (2004)*

*Chu YS, **Tkachuk A**, Vogt S, **Ilinski P, Walko DA, Tsui F**, Structural investigation of CoMnGe combinatorial epitaxial thin films using microfocused synchrotron X-ray* APPLIED SURFACE SCIENCE **223** (1-3): 175-182 FEB 15 (2004)

*Vogt S, Chu YS, **Tkachuk A**, **Ilinski P, Walko DA, Mancini DC, Dufresne EM, He L, Tsui F**. Composition characterization of combinatorial materials by scanning X-ray fluorescence microscopy using microfocused synchrotron X-ray beam, APPLIED SURFACE SCIENCE **223** (1-3): 214-219 FEB 15 (2004)*

*Tsui F, He L, Ma L, **Tkachuk A**, Chu YS, Nakajima K, Chikyow T, Novel germanium-based magnetic semiconductors* PHYSICAL REVIEW LETTERS **91** (17): Art. No. 177203 OCT 24 (2003)

Tkachuk, A., *H. Chen, Anti-ferrodistortive Nanodomains in PMN Relaxor, Fundamental Physics of Ferroelectrics, ed. by P.K. Davies and D.J. Singh, AIP Conf. Proc.,* ***677****, p. 55-64 (2003)*

Tkachuk, A., *H. Chen, P. Zschack, J. Tischler, E. Colla, DAFS Temperature Dependent Measurements on Superlattice Reflections in Lead Magnesium Niobate near Pb L_{III} absorption edge. (to be published)*

Tkachuk, A., *H. Chen, P. Zschack, J. Tischler, E. Colla,* Direct observation of antiferroelectric fluctuations in $Pb(Mg_{1/3}Nb_{2/3})O_3$ relaxor. (to be published)

Tkachuk, A. *and H. Chen,* Anomalous X-ray scattering study of chemical and polar nanodomains in $Pb(Mg_{1/3}Nb_{2/3})O_3$ single crystal*, Ferroelectrics,* ***253*** *p. 1-4 (2001).*

Tkachuk, A. *and H. Chen,* Synchrotron X-ray studies of superlattice ordering in $Pb(Mg_{1/3}\ Nb_{2/3})O_3$ single crystals doped with $PbTiO_3$ *Fundamental Physics of Ferroelectrics, 2001.* ***582****: p. 45-54.*

*Gosula, V.,****Tkachuk A,*** *K. Chung, and H. Chen,* X-ray scattering study of the transition dynamics in relaxor ferroelectric $Pb(Mg_{1/3}\ Nb_{2/3})O_3$ *, Journal of Physics & Chemistry of Solids, 2000.* ***61****(2): p. 221-227.*

Tkachuk, A., *H. Chen, P. Zschack, and E. Colla,* Anomalous synchrotron x-ray scattering studies of nanodomains in $Pb(Mg_{1/3}\ Nb_{2/3})O_3$. *AIP. American Institute of Physics Conference Proceedings, 2000.* ***535****: p. 136-142.*

Tkachuk, A., *K. Rogacki, D.E. Brown, B. Dabrowski, A.J. Fedro, C.W. Kimball, B. Pyles, X. Xiong, Daniel Rosenmann, B.D. Dunlap* Dynamics of Phase Stability and Magnetic Order in Magnetoresistive $La_{0.83}Sr_{0.17}MnO_3$ *, Phys. Rev. B.,* ***57,*** *8509 (1998)*

PRESENTATIONS:

Tkachuk A., P.M. Gehring, H. Chen, *Neutron Studies of Anti-ferrodistortive nanodomains in PMN Relaxor, Poster at 14th Williamsburg Ferroelectric Workshop, Williamsburg, Virginia, (2004)*

Tkachuk A. *Structural Frustration and Glass-like Freezing in $Pb(Mg_{1/3}Nb_{2/3})O_3$ Advanced Photon Source, X-ray/Neutron Summer School Alumni Presentations at APS User Meeting, April 24 (2003)*

Tkachuk A. *Synchrotron X-ray Studies of "Hidden" Phase Transition in Perovskite $Pb(Mg_{1/3}Nb_{2/3})O_3$ Relaxor Ferroelectric, Advanced Photon Source User Science Invited Seminar, January 31 (2003)*

Tkachuk A., *Anti-ferrodistortive Nanodomains in PMN Relaxor, 12th Williamsburg Ferroelectric Workshop, Williamsburg, Virginia, (2003)*

Tkachuk A., *H. Chen, Anti-ferrodistortive Nanodomains in PMN Relaxor, 12th Williamsburg Ferroelectric Workshop, Williamsburg, Virginia, (2002)*

Tkachuk A., *P. Zschack, Colla E., Chen H.,* Synchrotron X-ray Studies of Short-Range Ordered Atomic Displacements in PMN-6.25%PT Single Crystal*, Bull. Am. Phys. Soc.*, ***46****,1212 (2001)*

Tkachuk A., *Zschack P., Colla E.and Chen H.,* Synchrotron X-ray Studies of Superlattice Ordering in $Pb(Mg_{1/3}Nb_{2/3})O_3$ Single Crystals Doped with $PbTiO_3$*, 11th Williamsburg Ferroelectric Workshop, Williamsburg, Virginia, (2001)*

Tkachuk A., *Wu. Z., Chen H., Zschack P., Han P., Colla E., Thermal Diffuse Scattering and Superlattice Reflections in* $Pb(Mg_{1/3}Nb_{2/3})O_3$ and $[Pb(Mg_{1/3}Nb_{2/3})O_3]_{0.68}$-$(PbTiO_3)_{0.32}$ single crystals, *Bull. Am. Phys. Soc.*, ***45*** *510 (2000)*

Tkachuk A., *Chen H., Zschack P.,* Synchrotron X-ray Scattering Studies of Nanodomains in $Pb(Mg_{1/3}Nb_{2/3})O_3$*, Fundamental Physics of Ferroelectrics Workshop, Aspen, Colorado (2000)*

Tkachuk A., *C.H. Lin, and H. Chen, A. Vigliante, H. Dosch,* Electrical and Microstructural Charachterization of MOCVD Deposited $Pb(Sc_{1/2}Ta_{1/2})_{1-x}Ti_xO_3$ Thin Films, *Bull. Am. Ceram. Soc.*, ***79*** *154 (2000)*

Tkachuk A.*, B. Dabrowski, K. Rogacki, D.E. Brown, B. Pyles, R.T. Soliday, C.W. Kimball, B.D. Dunlap,* Defect-Driven Magnetic and Transport Behavior in $(LaMn_{0.98}{}^{57}Fe_{0.02})_{1-\delta}O_3$*, Bull. Am. Phys.Soc.*, ***42,*** *571 (1997)*

THESES:

University of Illinois, Urbana-Champaign, IL, USA, May 2002
Ph.D. Thesis: *Synchrotron Scattering Studies of Local Fluctuations in Lead Magnesium Niobate Relaxor Ferroelectrics*

Northern Illinois University, DeKalb, IL, USA, July 1997
M.S. Thesis: *Defect-Driven Magnetic and Transport Behavior in* $(LaMn_{0.98}{}^{57}Fe_{0.02})_{1-x}O_3$ *Colossal Magnetoresistance Oxides*

LANGUAGES:

- English, Russian, Ukrainian

PROFESSIONAL AFFIILIATIONS:

- Member of American Physical Society
- Member of American Ceramic Society

AWARDS AND HONORS:

- Argonne National Laboratory Master Thesis Graduate Fellowship, 1996-1997
- Research Fellowship at Max-Plank Institute fur Metallforschung, Stuttgart, Germany, June-August 2001
- Member of Sigma Xi honor research society

REFERENCES:

1. Professor Haydn Chen, (Ph.D. Thesis adviser)
   Professor of Materials Science & Engineering Department, University of Illinois
   Currently Head of Materials Science and Physics Department,
   City University of Honk Kong
   E-mail: aphchen@cityu.edu.hk

2. Professor George Crabtree
   Director of Materials Science Division, Argonne National Laboratory,
   Argonne IL
   E-mail: crabtree@anl.gov

3. Dr. Paul Zschack
   UNICAT Associate Director, Argonne National Laboratory, Argonne IL
   Tel: (630) 252-0860
   E-mail: zschack@anl.gov

4. Distinguished Prof. Clyde Kimball (M.S. Thesis adviser)
   Professor of Physics Department, Northern Illinois University, DeKalb IL
   Tel: (815) 753-0260
   E-mail: kimball@physics.niu.edu