

Irene Rusakova

Texas Center for Superconductivity and Advanced Materials
University of Houston Science Center,
Houston, TX 77004-5002
Phone: (713) 743-8286, FAX: (713) 743-8201
E-mail: rusakova@uh.edu

Education:

PhD in Physics and Material Science	Institute of Metal Physics and Metallography of the Bardin Central Research Institute of Ferrous Metallurgy, Moscow, USSR	1978
One year of PhD program	Case Western Reserve University, Cleveland, Ohio	1976-1977
MS in Physics of Metals, Honors	Moscow Institute of Steel and Alloys, Moscow, USSR	1971

Thesis Advisor(s): Prof. L.M. Utevsky and Prof. V.L. Indenbom (Institute of Crystallography, Academy of Sciences of the USSR, Moscow);
Prof. R. Gibala and Prof. T.E. Mitchell (Case Western Reserve University, Cleveland, Ohio).

Research Experience:

Texas Center for Superconductivity, University of Houston

Senior Research Scientist	1998-present
Research Scientist	1992-1998

Recent Research Highlights:

- Phase analysis and structural characterizations in the series of new HTS compounds (bulks, films, and tapes).
- Structure research of shallow junctions formed by rapid thermal processing and point defect engineering.
- Study of nanostructures based on metal nanocrystals in insulator or semiconductor or semiconductor nanocrystals in metal. Emphasis is placed on the interface structure in relation to the optical, electrical and optoelectronic properties.
- Nanocrystalline magnetite powders were synthesized by an electrocoagulation technique. A mechanism involving competition between nucleation and growth of free colloids and coarsening of the skeletal framework was proposed to explain the temporary level-off in crystallite size during the synthesis.
- First relaxivity studies on derivitized Gd@C₆₀ fullerenes: Gd@C₆₀[C(COOH)₂]₁₀ and Gd@C₆₀(OH)₂₃ have been performed and it was found that the type of substitution on the fullerene shell determined the relaxivity-temperature dependence.
- Study of nonlinear optics materials (LiTaO₃) after ion beam processing.
- Study of YBCO after different types and doses of irradiation and dopant effects.
- TEM characterization of GaN thin films and InGaN/GaN layers and heterostructures deposited by different methods of beam epitaxy on various substrates.

Lab Facilities/Expertise:

- Physics of diffraction, and extensive experience in many aspects of electron microscopy, including CTEM, HRTEM, CBED, EELS, EDS, and SEM.

- Physical properties relationship of a broad class of solids, including bulk materials, thin films, and tapes of high temperature superconductors and related oxides, semiconductors and structures of their basis, fullerenes, metals and alloys, subjected to various treatments.
- TEM, STEM, SEM and variety of other Lab. equipment related to these electron microscopes and sample preparation.

Institute of Metal Physics and Metallography of the Bardin Central Research Institute of Ferrous Metallurgy, Moscow, USSR

Senior research scientist, Research Scientist, Associate researcher 1978-1991

- Micro-structural analysis of rapidly quenched austenite alloys.
- Studies of correlation between micro-structure of different alloys and their physical properties.
- Studies of linear, planar and clusters of point defects in fcc and bcc crystal structures using TEM and computer simulation methods.
- Diffraction physics: developed analytical approximation for electron scattering.
- Developed customized software for the transmission electron microscope method.

Institute of Metal Physics and Metallography of the Bardin Central Research Institute of Ferrous Metallurgy, Moscow, USSR.

Doctoral Student 1974-1978

- Study of TEM Contrast on Crystal Defects using Theoretical Micrographs.

Moscow Institute of Steel and Alloys, Department of Cybernetics.

Computer programmer. 1971-1974

- Programming with Fortran and PL.

English-Russian translation of the following monographs:

"Diffraction Electron Microscopy" (1984) and "Analytical Electron Microscopy" (1990) published by the "Metallurgy", one of the central publishing houses in the former USSR.

Teaching experience:

Lecturer, University of Houston.
 Department of Mechanical and Materials Engineering. MECE 7377. 1999
 Graduate course: "Micro-Structural Electron Microscopy".
 Department of Chemistry, 6396. 2004,
 Graduate course: "Instrumental Methods of Analysis of Inorganic Materials". 2005

Professional Membership:

Materials Research Society

Publications / Conference presentations:

over 100 and 80, respectively; the list of publications is attached.

Selected Recent Publications:

1. Y.C. Weng, I. Rusakova, A. Baikalov, J.W. Chen, and N.L. Wu, *Microstructural Evolution of Nanocrystalline Magnetite Synthesized by Electrocoagulation*, Journal of Material Research, **20**, No.1, 75-80, 2005.
2. B. Sitharaman, R. Boskar, I. Rusakova and, L. J. Wilson, *Gd@C₆₀(OH)₂₃ and Gd@C₆₀[C(COOK)₂]₁₀: Nanoscale Aggregation Studies of Two Metallofullerene MRI Contrast Agents in Aqueous Solution*, Nano Letters, **4**, No.12, 2373-2378, 2004.
3. B. Sitharaman, S. Asokan, I. Rusakova, M. S. Wong, and L. J. Wilson, *Nanoscale Aggregation Properties of Neuroprotective Carboxyfullerene (C₃) in Aqueous Solution*, Nano Letters, **4**, No.9, 1759-1762, 2004.
4. Ragesh Ranjit, Wanda Zagodzdon-Wosik, Irene Rusakova, Paul van der Heide, Zu-Hua Zhang, Joe Bennett, *Formation of contacts and ultra shallow junctions using diborides of Ti, Zr and Hf*, Reviews on Advanced Materials Science, **8**, #2, 176-184, 2004.
5. Wanda Zagodzdon-Wosik, Deepa Radhakrishnan, Chinmay Darne, Irene Rusakova, Paul van der Heide, Zu-Hua Zhang, Joe Bennett, Len Trombetta, Prashant Majhi, *Refractory metallic borides used for gate electrode applications in CMOS integrated circuits*, Reviews on Advanced Materials Science, **8**, #2, 185-194, 2004.
6. L. Shao, X. Wang, I. Rusakova, H. Chen, J. Liu, P.E. Thompson, and W.K. Chu, *Study on interfacial Dislocations of Si Substrate/ Epitaxial Layer by Defect Trapping*, Nuclear Instruments and Methods in Physics Research B 219-220, 938-941, 2004.
7. C.Y. Tung, N.L. Wu, I.A. Rusakova, *Synthesis of Mesoporous Crystalline SnO₂ of Large Surface Area by Combination of Supramolecule Templating and Grain Growth Inhibition*, Journal of Material Research, **18**, No. 12, 2890-2894, 2003.
8. L. Shao, X. Wang, I. Rusakova, H. Chen, J. Liu, P.E. Thompson, and W.K. Chu, *Study on interfacial Dislocations of Si Substrate/ Epitaxial Layer by self-interstitial decoration technique*, Applied Physics Letters, **83**, 934-936, 2003.
9. L. Shao, X. Wang, I. Rusakova, H. Chen, J. Liu, J. Bennett, L. Larsen, J. Jin, P.A.W. van der Heide, and W.K. Chu, *Stability Studies of Ultra-Shallow Junction formed by Low Energy Boron Implant and Spike Annealing*, Journal of Applied Physics, **92**, 5788, 2002.
10. Z. Zhang, I.A. Rusakova, and W.K.Chu, *Amorphization and Annealing of LiTaO₃ Single Crystal Irradiated with Ar⁺ Ions at 77K*, Journal of Applied Physics, **91**, #6, 3562-3568, 2002.