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BACKGROUND

Dr. Helen H. Farrell is a Scientist at the Idaho National Laboratory (INL) where she has worked since 1999. Farrell earned a B.S. and an M.S. in Chemistry from the University of Massachusetts in 1964 and 1966, respectively, and a Ph.D. in Chemistry from the University of California at Berkeley in 1969. She has since worked at Brookhaven National Laboratory, Bell Telephone Laboratories, Bellcore and the University of Illinois at Champaign-Urbana. She has also worked for 3 years as a full time Program Manager (IPA) in the Office of Basic Energy Science (BES) in DOE, and 6 years as a part-time detailee in a similar position.

Farrell has more than thirty years of fundamental research experience in the fields of materials science, physics and chemistry. She has extensive experience in the field of surface science, and has published widely in this general area. She has also worked in the areas of superconductivity, grain boundary diffusion, epitaxial growth on semiconductor surfaces and thin films. Over the last twenty years, or so, she has focused on the structure of the surfaces of semiconductor compounds, both under ultra-high vacuum and during crystal growth. Farrell has worked with a variety of surface sensitive techniques including LEED, RHEED and HREELS. She has also worked at a number of synchrotron facilities and has considerable experience with a variety of electron spectroscopies, including Auger, UPS and XPS, and has previously worked on matrix corrections, modeling and mean free path calculations for electron spectroscopies. After doing managerial and administrative work, she has recently returned to research in both the areas of nanostructures, oxide and semiconductor surfaces and interfaces and high temperature catalysts. Farrell is currently collaborating with Prof. C.J. Palmstrøm at the University of Minnesota in Minneapolis and with Prof. Darrell Schlom at Pennsylvania State University.

She obtained managerial and administrative experience while working at the University of Illinois, in BES at DOE and at INL. While at the University of Illinois at Urbana-Champaign, she managed the Surface Analysis Group in the Frederick Seitz Materials Research Laboratory (MRL). There, she was responsible for 5 professional scientists, 2 technicians, 6 large commercial instruments (and numerous small) and more than 250 facility-users per annum. She also had the responsibility for developing new, in-house equipment, designing brochures of the facilities, and other more mundane but necessary activities.

While at BES, Farrell worked in both the Divisions of Materials Sciences and the Division of Chemical Sciences. In the former, she managed more than 20 university core programs plus 30 EMSP university and laboratory programs. In the latter, she managed 43 university and 10 laboratory programs. Her responsibilities also included screening proposals and pre-proposals

(>1000), site visits, representing BES at various inter- and intra- agency meetings and arranging a variety of peer review panels and evaluating EPSCoR programs. She is a recipient of Vice President Gore's 1998 EMSP Hammer Award.

At the INL, Farrell initially worked with the LDRD/URC (University Research Consortium) programs and then with the University Alliance programs in the Academic and Professional Affairs Department. She served as Chair of the INEEL Seminar Series Committee during this time as well. In 2001, she moved to the Materials Physics Department where she now divides her time between doing research and administration. Her current research program focuses on model calculations using first principles, density functional theory calculations. Present topics of interest are materials for high field superconductors, interfaces in semiconductors and oxides and nanoparticle catalysts for hydrogen production.

Farrell has a solid record of scientific and technical achievement. During the time that she has done basic research, she has written more than 90 articles for peer reviewed publications including 17 Physical Review, Physical Review B or Physical Review Letters. Since joining the Materials Sciences Department at INL, she has produced fourteen peer reviewed publications and currently has six additional articles either in preparation for or submitted to peer reviewed journals. Farrell has collaborated with a wide variety of scientists from both the United States and other countries including the United Kingdom, Germany, Switzerland, Spain, Brazil and China. A short list of her recent collaborators is listed on the next page.

Farrell's work supports the INL Energy Sciences and Technology Mission. She has received DOE Office of Basic Energy Sciences (BES) funding since 2001 for basic research on nanoparticles and heterogeneous interfaces. She has participated in two BES Center for Synthesis and Processing (CS&P) proposals, one of which was funded. Though the overall CS&P program was subsequently eliminated, this led to some funding for work on high-field superconductors that supports INL's long-term fusion efforts. She has also received LDRD funding on this general topic. Farrell has also received LDRD funding for work on catalysts for hydrogen production from nuclear powered sulfur-iodine thermochemical cycles with Daniel Ginosar and Lucia Petkovic. This is expected to lead to a mid-sized proposal for the upcoming BES "Energy Frontier ResearchCenter" Call.

While working for BES, Farrell served on numerous Experimental Program to Stimulate Competitive Research (EPSCoR) and National Laboratory Site Review Committees. She is currently a quarter time detailee in the Division of Materials Sciences and Engineering at the Office of Basic Energy Sciences. Since joining INL, she has been a member of BES Site Review Committees for ANL, SNL, LANL, ORNL, Stanford-SSRL and SNL-W. She has also participated in informal BES site visits at LLNL and LBNL-ALS. She has been a member of the Program Committee for the Physics and Chemistry of Semiconductor Interfaces, an American Vacuum Society meeting, since 2004. Farrell routinely reviews for professional journals in her field. She is presently a member of the American Vacuum Society, the American Chemical Society, and the Materials Research Society. She has also been an invited speaker at NSF Workshops on Heterogeneous Interfaces in 2004 (Moab, UT) and 2005 (Yosemite, CA) and at the US-Ireland Workshop on Nanotechnology, October 23-24, 2006 in Belfast, Northern Ireland,

UK. In 2007, she was the recipient of the Laboratory Director's Awards for Individual Lifetime Achievement in Science and Technology.

EMPLOYMENT HISTORY

- January 1999 – Present; Idaho National Engineering and Environmental Laboratory, Consulting Scientist
- January 1996 – January 1999; U.S. Department of Energy, Program Manager in the Office of Basic Energy Science
- March 1992 – August 1995; University of Illinois at Urbana-Champaign, Surface Analysis Group Leader in the Center for Microanalysis of Materials (MRL)
- January 1984 – June 1991; Bellcore, Member of Technical Staff
- September 1972 – January 1984; AT&T Bell Telephone Laboratories, Member of Technical Staff
- September 1969 – September 1972; Brookhaven National Laboratory, Technical Staff Member
- June 1966 – September 1969; University of California; Lawrence Radiation Laboratory
- Fall 1962 – Summer 1964; University of Massachusetts

EDUCATION

- Ph.D., Chemistry, 1969 – University of California, Berkeley
- M.S., Chemistry, 1966 – University of Massachusetts
- B.S., Chemistry, 1964 – University of Massachusetts

(Includes more than 45 credit hours of physics and more than 24 credit hours of mathematics.)

COLLABORATORS (since 2001)

Dr. Daniel M. Ginosar (INL), Dr. Lucia M. Petkovic (INL), Dr. Harry W. Rollins (INL), Dr. Sergey N. Rashkeev (INL), Dr. Randal A. LaViolette (currently SNL, formerly INL), Dr. Arthur B. Denison (INL, LLNL – retired),

Prof. Christopher J. Palmstrøm (U. of Minnesota), Dr. Katie Ludge (Tech. Univ., Berlin, Inst. Festkörperphys), Prof. Darrell Schlom (Pennsylvania State Univ.), Prof. Gerry J. Lapeyre (Montana State Univ. – retired)

MANUSCRIPTS in PREPARATION

1. **H. H. Farrell**, D. M. Ginosar, L. M. Petkovic, H. W. Rollins, K. C. Burch and P. J. Pinhero, High-Temperature, “Size Dependent Sublimation Effects in Pt Nanoparticle Catalysts”, to be submitted to the Journal of Physical Chemistry.
2. **H. H. Farrell**, Randall A. LaViolette, McMillan Equation as Applied to Metal Diborides, to be submitted to Physical Review Letters.
3. R. D. Parra and **H. H. Farrell**, Copper Oxide Nanoparticles, in preparation for submission to the Journal of Chemical Physics.

PUBLICATIONS

1. **H. H. Farrell**, C. D. Van Sicle, D. M. Ginosar, L. M. Petkovic, and R. D. Parra, Surface Bonding Effects in Compound Semiconductor Nanoparticles: I, submitted to Journal of Vacuum Science & Technology A.
2. R. D. Parra and **H. H. Farrell**, Binding Energy of Oxide Nanoparticles, submitted to the Journal of Physical Chemistry C.
3. **Helen Farrell**, Brian Schultz, and Christopher Palmstrom, Comment on 'High-resolution core-level photoemission study on GaAs(111)B surfaces', submitted for publication in the Journal of Applied Physics.
4. **H. H. Farrell**, Surface Bonding Effects in Compound Semiconductor Nanoparticles: II, accepted for publication in Journal of Vacuum Science & Technology B.
5. S. N. Rashkeev, D. M. Ginosar, L. M. Petkovic, and **H. H. Farrell**, Catalytic Activity of Supported Metal Particles for Sulfuric Acid Decomposition Reaction, accepted for publication in Catalysis Today.
6. L.M. Petkovic , D.M. Ginosar, H.W. Rollins, K.C. Burch, P.J. Pinhero, and **H.H. Farrell**, Pt/TiO₂ (rutile) catalysts for sulfuric acid decomposition in sulfur-based thermochemical water-splitting cycles, Applied Catalysis A: General 338 (2008) 27–36.
7. **H. H. Farrell**, C. D. Van Sicle, Binding Energy, Vapor Pressure, and Melting Point of Semiconductor Nanoparticles, Journal of Vacuum Science & Technology B 25 (4): 1441-1447 Jul.-Aug. 2007.
8. **H. H. Farrell**, R. A. LaViolette, T. M. Lillo, Diatomic Substitutionals in Superconducting Nb(1-X)B₂, Physica C-Superconductivity and its Applications, 449 (1): 1-8 Nov. 1 2006.

9. **Farrell HH**, Hilton JL, Schultz BD, et al., Nonequilibrium phases in epitaxial Mn/GaAs interfacial reactions, *Journal of Vacuum Science & Technology B* 24 (4): 2018-2023 Jul-Aug 2006.
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11. **Farrell HH**, LaViolette RA, Anion variations at semiconductor interfaces: ZnSe(100)/GaAs(100) superlattices, *Journal of Vacuum Science & Technology B* 23 (2): 406-416 Mar-Apr 2005.
12. Denison AB, **Farrell HH**, Positron mean free paths between 50 eV and 40 keV, *Physical Review B* 69 (10): Art. No. 104302 Mar 2004.
13. **Farrell HH**, Laviolette RA, Schultz BD, Lüdge K, Palmstrøm CJ, Self-assembled CoAs nanostructures, *Journal of Vacuum Science & Technology B* 21 (4): 1760-1764 Jul-Aug 2003.
14. Denison AB and **Farrell HH**, Positron mean free paths between 50 eV and 40 KeV, Semi-empirical inelastic mean free paths for positrons, *Surface and Interface Analysis* 37 (6): 529-533 Jun 2005.
15. Schultz BD, **Farrell HH**, Evans MMR, Lüdge K, and Palmstrøm CJ, ErAs interlayers for limiting interfacial reactions in Fe/GaAs(100) heterostructures, *Journal of Vacuum Science & Technology B* 20 (4): 1600-1608 Jul-Aug 2002.
16. **Farrell HH**, Lu J, Schultz BD, Denison AB, Palmstrøm CJ, GaAs(111)B($\sqrt{19} \times \sqrt{19}$)R23.4 degrees surface reconstruction, *Journal of Vacuum Science & Technology B* 19 (4): 1597-1605 Jul-Aug 2001.
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20. Quinn WE, Tamargo MC, Brasil MJSP, Nahory RE, **Farrell HH**, Organometallic molecular-beam epitaxy growth and characterization of INXAL1-XAS on INP, *Journal of Vacuum Science & Technology B* 10 (2): 978-981 Mar-Apr 1992.

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