

# Tony E. Haynes

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## Education

Wake Forest University, Winston-Salem, NC	Math and Physics	B.S., <i>Summa Cum Laude</i> , 1982
University of North Carolina, Chapel Hill, NC	Physics	Ph.D., 1987

## Research Interests

Ion-solid interactions, ion-beam synthesis and modification of materials; Behavior of point- and extended-defects in semiconductors; Solid-phase crystallization of amorphous semiconductors; Magnetism and phase transitions in nanostructured materials; Defects and dopants in transparent conducting oxides. Results reflected in more than 120 research publications (cumulative citations >2600) and 5 patents.

## Professional Experience

2003–p	User Program Manager, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2000–2003	Group Leader, Ion-Solid Interactions Group, Condensed Matter Sciences Division, Oak Ridge National Laboratory
1994–2001	Research Visitor, Silicon Processing Research Department, Bell Laboratories, Lucent Technologies
1996–1999	Adjunct Professor, Department of Physics, University of North Texas
1995–1998	Adjunct Professor, Dept. of Chemical, Bio, and Materials Engineering, Arizona State University
1987–2000	Senior Research Staff Member, Condensed Matter Sciences Division, Oak Ridge National Laboratory
1985, 1986	Summer Student Fellow, Ion-Solid Interactions Department, Sandia National Laboratories

## Professional and Synergistic Activities

2004	Volume Organizer, <i>MRS Bulletin</i> (12 issues)
2002	Technical Topic Manager, 2002 DOE-SBIR/STTR Program, “Ion Beam Applications for Materials Integration by Layer Transfer”
2001	Invited Discussion Leader, Gordon Research Conference on “Materials Processes Far from Equilibrium”
2001	Symposium Organizer, “Wafer Bonding and Thinning Techniques for Materials Integration,” Spring Meeting of the Materials Research Society
2000–2006	Membership Committee, Materials Research Society
2000	Guest Editor, <i>MRS Bulletin</i> topical issue, “Defects and Diffusion in Silicon Technology” (June)
1999	Symposium Organizer, “Silicon Front-End Processing: Physics and Technology of Dopant-Defect Interactions,” Spring Meeting of the Materials Research Society
1994–1997	Technical Advisory Board on Materials and Bulk Process Sciences, Semiconductor Research Corporation
Memberships	Materials Research Society; American Vacuum Society; Bohmische Physikalische Gesellschaft; Phi Beta Kappa

## Selected Peer-Reviewed Publications (author of >95 articles in refereed journals and books):

### Work Performed Under Earlier BES Funding

“Synthesis of Nearly Monodisperse Embedded Nanoparticles by Separating Nucleation and Growth in Ion Implantation,” V. Ramaswamy, T. E. Haynes, C. W. White, W. J. Moberly Chan, S. Roorda, and M. J. Aziz, *Nano Letters* **5**, 373 (2005).

“Photoinduced Phase Transition in VO<sub>2</sub> Nanocrystals: Ultrafast Control of the Surface Plasmon Resonance,” M. Rini, A. Cavalleri, R. W. Schoenlein, R. Lopez, L. C. Feldman, R. F. Haglund Jr., L. A. Boatner, and T. E. Haynes, *Optics Lett.* **30**, 558 (2005).

- “Optical Nonlinearities in VO<sub>2</sub> Nanoparticles and Thin Films,” R. Lopez, R. F. Haglund Jr., L. C. Feldman, L. A. Boatner, and T. E. Haynes, *Appl. Phys. Lett.* **85**, 5191 (2004).
- “Size Effects in the Structural Phase Transition of VO<sub>2</sub> Nanoparticles,” R. Lopez, T. E. Haynes, L. A. Boatner, L. C. Feldman, and R. F. Haglund, Jr., *Phys. Rev. B* **65**, 224113 (2002).
- “Role of Magnetostatic Interactions in Assemblies of Fe Nanoparticles,” T. C. Schulthess, M. Benakli, P. B. Visscher, K. D. Sorge, J. R. Thompson, F. A. Modine, T. E. Haynes, L. A. Boatner, G. M. Stocks, and W. H. Butler, *J. Appl. Phys.* **89**, 7594 (2001).
- “Binding Energy of Vacancies to Clusters Formed in Si by High-Energy Ion Implantation,” R. Kalyanaraman, T. E. Haynes, O. W. Holland, H.-J. Gossmann, C. S. Rafferty, and G. H. Gilmer, *Appl. Phys. Lett.* **79**, 1983 (2001).
- “Quantification of Excess Vacancy Defects from High-Energy Ion Implantation in Si by Au Labeling,” R. Kalyanaraman, T. E. Haynes, V. C. Venezia, D. C. Jacobson, H.-J. Gossmann, and C. S. Rafferty, *Appl. Phys. Lett.* **76**, 3379 (2000).
- “Mechanism for the Reduction of Interstitial Supersaturations in Medium-Energy Ion-Implanted Silicon following MeV Co-Implantation,” V. C. Venezia, T. E. Haynes, A. Agarwal, L. Pelaz, H.-J. Gossmann, D. C. Jacobson, and D. J. Eaglesham, *Appl. Phys. Lett.* **74**, 1299 (1999).
- “Efficient Production of Silicon-on-insulator Films by Co-Implantation of He<sup>+</sup> with H<sup>+</sup>,” A. Agarwal, T. E. Haynes, V. C. Venezia, O. W. Holland, and D. J. Eaglesham, *Appl. Phys. Lett.* **72**, 1086 (1998).
- “Physical Mechanisms of Transient Enhanced Dopant Diffusion in Ion-Implanted Silicon,” P. A. Stolk, H.-J. Gossmann, D. J. Eaglesham, D. C. Jacobson, C. S. Rafferty, G. H. Gilmer, M. Jaraíz, J. M. Poate, and T. E. Haynes, *J. Appl. Phys.* **81**, 6031 (1997).
- “The Interstitial Fraction of Diffusivity of Common Dopants in Silicon,” H.-J. Gossmann, T. E. Haynes, P. A. Stolk, C. A. King, R. W. Johnson, D. C. Jacobson, J. M. Poate, H. S. Luftman, T. Mogi, and M. O. Thompson, *Appl. Phys. Lett.* **71**, 3862 (1997).
- “Interactions of Ion Implantation Induced Interstitials with Boron at High Concentrations in Silicon,” T. E. Haynes, D. J. Eaglesham, P. A. Stolk, H.-J. Gossmann, D. C. Jacobson, and J. M. Poate, *Appl. Phys. Lett.* **69**, 1376 (1996).
- “Composition Dependence of Solid-Phase Epitaxy in Silicon-Germanium Alloys: Experiment and Theory,” T. E. Haynes, M. J. Antonell, C. A. Lee, and K. S. Jones, *Phys. Rev. B* **51**, 7762 (1995).

#### Patents

- U.S. Patent No. 6,632,728, “Increasing the Electrical Activation of Ion-Implanted Dopants,” issued October 14, 2003.
- U.S. Patent No. 5,910,220, “Apparatus and Method for Selective Area Deposition of Thin Films on Electrically Biased Substrates,” issued June 8, 1999 (division of Pat. No. 5,354,583).
- U.S. Patent No. 5,607,731, “Method for Forming Electrical Pathways in Indium-Tin-Oxide Coatings,” issued March 4, 1997 (division of Pat. No. 5,580,641).
- U.S. Patent No. 5,580,641, “Method of Forming Electrical Pathways in Indium-Tin-Oxide Coatings,” issued December 3, 1996.
- U.S. Patent No. 5,354,583, “Apparatus and Method for Selective Area Deposition of Thin Films on Electrically Biased Substrates,” issued October 11, 1994.

#### Collaborations Outside ORNL During Past Two Years:

None

#### Graduate and Postdoctoral Advisors:

Graduate Advisor: Prof. Wei-Kan Chu (University of North Carolina, Chapel Hill)

#### Thesis Advisor and Postgraduate-Scholar Sponsor:

##### Students

R. Lopez (Ph.D., Vanderbilt University, 2002); K. D. Sorge (Ph.D., University of Tennessee, 2002); V. C. Venezia (Ph.D., U. North Texas, 1998); C. Jasper (M.S., Arizona State Univ., 1995); M. J. Antonell (M.S., University of Florida, 1994); C. A. Lee (M.S., University of Florida, 1993)

##### Postdoctoral Scholars:

R. Kalyanaraman, ORNL (1998–2001); A. Agarwal, ORNL (1994–1997)

Total Graduate Students Advised: 7

Total Postdoctoral Scholars Advised: 2