

## Ramki Kalyanaraman, Assistant Professor

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### Professional Preparation

Indian Institute of Technology, Kharagpur	Physics	M.Sc.	1991
Indian Institute of Technology, Kanpur	Materials Sci. & Eng.	M.Tech.	1994
North Carolina State University, Raleigh	Materials Sci. & Eng.	Ph.D.	1998
Oak Ridge National Lab. & Lucent Technologies Bell Labs.	Materials Physics	Post-Doc. Fellow	2001

### Appointments

North Carolina State University	Graduate Research Assistant	Jan 1995 - Dec 1998
Oak Ridge National Lab. and Lucent Technologies	Postdoctoral Research Fellow	Jan 1999 - July 2001
Washington University in St. Louis	Assistant Professor	August 2001 - Current

### Honors and Awards

Elected to Phi Kappa Phi Honor Society	1998
CRADA (Cooperative R & D Agreement) - Joint Postdoctoral Fellow - ORNL and Lucent Bell Labs.	1999-2001
Invited talk, 16 <sup>th</sup> Int. Conf. on the Applications of Accelerators in Research and Industry	2000
Invited talk, MRS Fall Meeting	2000
NSF CAREER Award	2005-2010
Invited Contribution, TMS Annual Meeting	2005
Invited Talk, International Workshop on Nanopatterning via Ions, Photon Beams and Epitaxy	2007
Invited Talk, MRS Spring Meeting	2008
Invited Talk, Society of Manufacturing Engineers	2008

### Summary of other Significant Achievements

\* *Interview*: IOP's "60 seconds with the Author" Interview on our work on *Heterogeneous nucleation of amorphous alloys on catalytic nanoparticles to produce 2D patterned nanocrystal arrays*, Nanotechnology, 18, 485606 (2007). Read at <http://www.iop.org/EJ/journal/-page=featauth/-author=756/0957-4484> (2008).

\* *News Report*: J. Trice, H. Garcia, R. Suresh Kumar, and R. Kalyanaraman, *Model makes better solar cells*, nanotechweb.org/ articles/news/6/9/17/1 (2007).

\* *Book chapter*: H.Krishna and R.Kalyanaraman, *Functional nanostructured thin films*, Appearing in Book, Functional nanostructures: Synthesis, properties and applications, Edited by S. Seal, Springer, (41 pages) (2007).

\* *Review*: R. Kalyanaraman, T.E.Haynes, V.C.Venezia, D.C.Jacobson, H.-J.L.Gossmann, and C.S.Rafferty, *Quantitative Measurements of vacancy defects in high-energy ion implanted Si*, Def. Diff. Forum, 200-202, 177-186 (2002).

\* *Book chapter*: D.Kumar, R.Kalyanaraman, S.Oktyabrsky, and J.Narayan, *High-T<sub>c</sub> Physical Structures and Role of Constituents*, in Wiley Encyclopedia of Electrical and Electronics Engineering (1999).

\* *Patent*: H.-J.L.Gossmann, C.S.Rafferty, T.E.Haynes, R.Kalyanaraman, V.C.Venezia, and M.L.Pelaz, *A process for fabrication of semiconductor devices on Si-on-insulator substrates*, US Patent No. 6,632,728.

### Research Interests

**Self-organization and pattern formation**: *Dynamics, pattern evolution and length scale selection in unstable systems*; Non-equilibrium processing under fast laser-material interactions; Thin film nucleation and growth; Thermal and mass transport in solid and liquid-phase; Nonlinear pattern formation.

**Nanomaterials for plasmonics and nanophotonics**: *Nanomaterials for solar energy harvesting*; Multiwavelength surface enhanced raman scattering (SERS) for biological/environmental sensing; Nanocomposites for ultrafast and ultrahigh density optical information processing; Linear and nonlinear optics; Optical characterization.

**Electronic materials**: *Electronic properties under non-equilibrium processing*; Nanoscale magnetic storage and sensing; Electronics in embedded nanoarrays; Spintronics through oxide-based semiconductor-magnetic nanocomposites; Optoelectronics through ordered and oriented quantum dots.

**Multifunctional nanocomposites**: *Knowledge-based materials design*; Self-organized materials assembly in 1-, 2- and 3-D; Structure-processing property correlations; Nano- and micro-structure studies; Electron microscopy (transmission, scanning); Scanning probe microscopy (magnetic force, atomic force).

## Ph.D./Post-Doc. Advisers

**Doctoral Research:** Prof. J. Narayan (*North Carolina St. Univ.*), Prof. K. Jagannadham (*North Carolina St. Univ.*)

**Post-Doctoral Research:** Dr. T.E. Haynes (*ORNL*), Dr. C.S. Rafferty and Dr. H.-J.L. Gossmann (*Lucent's Bell Labs.*)

## Collaborators (48 Months)

R. Sureshkumar, A.Q. Shen, K.F. Kelton, P.C. Gibbons, A.K. Gangopadhyay, J. Schilling, Z. Nussinov (*Washington University in St. Louis*); H. Garcia (*SIU in Edwardsville*); B. Khomami (*UT Knoxville*); W. White, L.A. Boatner, S. Withrow (*ORNL*).

## Teaching

<u>Course</u>	<u>Years Taught</u>
Introduction to Solid State Physics - Phy 422	Sp 03, 04, 05, 06
Optics and Wave Physics Lab. - Phy 316	Fall 02, 03, 04, 06
Physical measurements Lab. - Phy 322	Spring 06, 07
Physics of thin films - Phy 589	Fall 01
Introduction to Nanotechnology - ME 163	Fall 05 Co-instructor

## Mentoring

Ph.D. (Graduated)	Chi Zhang (July 2004), Thesis: <i>A novel in-situ technique to fabricate thin films with controlled lateral thickness modulations</i>
Ph.D. (In progress)	C. Favazza (To graduate in May 08), J. Trice (To graduate in May 08), H. Krishna
Ph.D. Committees	<u>Physics:</u> K. Wieland, Y. Shao, T.H. Kim, Y. Shen, M. Monville, T. Tomita, P. Wei, K. Croat, V.T. Huett, G.W. Lee <u>Chemistry:</u> D. Boucher, R.K. Lammi, H. Fields, C. Gudipati, C.J. Otten
Graduate/Masters	L. L-Spoor, W. Zhang, M. Monville, Chul Kim (Environmental Eng.)
Undergraduate	E. Mintun, N. Nemoto, D. Katz, A. Sabet, S. Robinson, S. Katz, D. Sethna
High-School	M. Hyrc ( <i>won 2007 Solutia Award for Excellence in Research</i> ), C. Ronzio, S. Lim, J.C. Poland ( <i>won 2005 Solutia Award for Excellence in Research</i> )

## Scientific Service, Synergistic Activities and Outreach

### Conferences and Publications

- \* International organizing committee, *International Workshop on Nanopatterning via Ions, Photon beams and Epitaxy* (Sestri Levante, Italy, September 2007).
- \* Lead organizer, MRS Fall 2006 Symposium N: *Self-assembly of Nanostructures by Photon and Ion Beams: Fundamentals and Applications* (Boston, December 2006)
- \* Editor, MRS Symposium Proceedings, Vol 960E, 2007.
- \* Session Chair, APS March Meeting 2007: *Session P42: Focus Session: Biological and Chemical Self-Assembly at Surfaces* (Denver, 2007).
- \* Session chair, MRS, Fall Meeting, *Symposium KK: Kinetics-driven nanopatterning of surfaces* (Boston, 2004).

### Reviewing

- \* *Journals:* J. Mat. Res., Appl. Phys. Lett., J. Appl. Phys., J. Phys. D, Thin Sol. Films, Mat. Res. Soc., TMS, Nanotechnology.
- \* *Proposals:* NSF (Panelist and ad-hoc reviewer), DOE, US-CRDF.

### Society Affiliations

Material Research Society (MRS), American Physical Society (APS), Optical Society of America (OSA), The Minerals, Metals & Materials Society (TMS), The International Society for Optical Engineering (SPIE), American Institute of Chemical Engineers (AIChE).