

NAME: SHAILAJA MAHAMUNI
DESIGNATION: Professor in Physics
ADDRESS: Department of Physics
University of Pune, Pune 411 007.
e-mail: shailaja@physics.unipune.ac.in
FAX: ++ 91-20-25691684

Area of Research: Optics of Nanostructures, Magnetism in Nanostructures

Facilities: Low temperature, high resolution Photoluminescence
Optical spectrometer to study single quantum dot

Glimpses of Current Research

Confinement effects on electron energy levels of luminescent quantum dots are being studied by the optical probes. The systems under study are ZnSe, doped and alloyed ZnSe quantum dots.

Un-doped as well as doped ZnO nanocrystals showed ferromagnetic ordering that is closely related to the defect density. A correlation between ferromagnetic ordering and charge transfer in coupled ZnO based nanostructures are being studied.

VIII) People: Current Graduate Students

- (1) Deepak More
- (2) Ch. Rajesh
- (3) Kiran Sonawane
- (4) Darshana Inamdar
- (5) Chinmay Phadnis
- (6) Shital Vaidya
- (7) Shital Kahane

Alumni of the Group

Dr. Amit Lad
Dr. S.D. Kshirsagar
Dr. Kavita Borgohain
Dr. B.S. Bendre
Dr. M. Islam
Dr. V.V. Nikesh
Dr. Neelesh Kumbhojkar
Dr. Shashikant Patole
Ms. Pratibha Kadam

PUBLICATIONS

60. Competitive Effects of Film Thickness and Growth Rate in Spray Pyrolytically Deposited

Fluorine-doped Tin Dioxide Films

Chitra Agashe, and Shailaja Mahamuni, *Thin Solid Films* **518**, 4868 (2010).

59. Two Photon Absorption in Mn^{2+} -doped ZnSe Quantum Dots
D. More, Ch. Rajesh, Amit Lad, G.R. Kumar, and Shailaja Mahamuni
Optics Communications **283**, 2150 (2010).
58. Ferromagnetism in ZnO Nanocrystals: Doping and Surface Chemistry.
D. Y. Inamdar, A. D. Lad, A.K. Pathak, I. Dubenko, N. Ali, and Shailaja Mahamuni
J. Phys. Chem. C **114**, 1451(2010).
57. Optical Properties of Zinc Selenide Clusters From First Principle Calculations
S. P. Nanavati, V. Sundarajan, Shailaja Mahamuni, V. Kumar, S.V. Ghaisas,
Phys.Rev.B **80**, 245417 (2009).
56. Effect of ZnS Shell Formation on the Confined Energy Levels of ZnSe Quantum Dots.
Amit D. Lad and Shailaja Mahamuni, *Phys.Rev. B* **78**, 125421 (2008).
55. Exciton Recombination Dynamics in Zinc Selenide Quantum Dots.
Ch. Rajesh, A. D. Lad, A. Ghangrekar, and Shailaja Mahamuni,
*Solid State Commun.***148**, 435 (2008).
54. Al-doped ZnO Nanocrystals.
Pratibha Kadam, Chitra Agashe, and Shailaja Mahamuni, *J.Appl.Phys.* **104**, 193501(2008).
53. Electron Energy Structure and Photoluminescence of Manganese-doped Zinc Selenide Quantum Dots
Shailaja Mahamuni, Amit D. Lad, and Shashikant Patole, *J.Phys.Chem.C* **112**, 2271 (2008).
52. Two-photon Absorption in ZnSe and ZnSe/ZnS Core/Shell Quantum Structures
Amit Lad, P. Prem Kiran, Deepak More, G. Ravindra Kumar, and Shailaja Mahamuni
Appl.Phys.Lett. **92**, 043126 (2008).
51. Formation of Room Temperature Ferromagnetic $Zn_{1-x}Co_xO$ Nanocrystals
S. Kshirsagar, D. Inamdar, I.K. Gopalkrishnan, S.K. Kulshreshtha, and Shailaja Mahamuni,
Solid State Communications **143**, 457 (2007).
50. Three Photon Absorption in ZnSe and ZnSe/ZnS Quantum Dots
Amit Lad, P. Prem Kiran, G. Ravindra Kumar, and Shailaja Mahamuni
Appl.Phys.Lett. **90**, 133113 (2007).
49. Magnetic Behavior of Manganese-doped ZnSe Quantum Dots
Amit D. Lad, Ch. Rajesh, I. K. Gopalakrishnan, S. K. Kulshreshtha, Mahmud Khan,
Naushad Ali and Shailaja Mahamuni, *J. Appl. Phys.* **101**, 103906 (2007).
48. Exciton Structure in Sodium Doped Zinc Oxide Quantum Dots
S. Kshirsagar, V.V. Nikesh, and Shailaja Mahamuni, *Appl.Phys.Lett.* **89**, 053120 (2006).
47. Electron Energy Levels in ZnSe Quantum Dots
V.V. Nikesh, A. Lad, S. Kimura, S. Nozaki, and Shailaja Mahamuni,
J.Appl.Phys. **100**, 113520 (2006).

46. Hyper-Rayleigh Scattering in Electrochemically Synthesized Ag–Au Coupled Clusters
J. W. Dadge, M Islam, A. K. Dharmadhikari, Shailaja Mahamuni and R. C. Aiyer
J.of Physics:Cond.Matter **18**, 5405(2006).
45. Optical Studies of ZnO/Ag Nanojunctions
S. Patole, M. Islam, R.C. Aiyer, and Shailaja Mahamuni, *J.Mater.Sci.* **41**, 5602 (2006).
44. X-ray Photoelectron Spectroscopic Investigations of Cu₂O Nanoparticles
V.V. Nikesh, A.B. Mandale, K.R. Patil, and Shailaja Mahamuni,
Mat.Res.Bull. **40**, 694 (2005).
43. Optical Nonlinearity of Monodispersed, Capped ZnS Quantum Particles
V.V. Nikesh, A. Dharmadhikari, H. Ono, Shinji Nozaki, G. Ravindra Kumar,
and Shailaja Mahamuni, *Appl.Phys.Lett.* **84**, 4602 (2004).
42. Luminescence in ZnO Quantum Particles
B.S. Bendre and Shailaja Mahamuni, *J. Materials Research* **19**, 737 (2004).
41. Synthesis and Studies of Cu₂O Quantum Particles.
Kavita Borgohain, Norio Murase, and Shailaja Mahamuni, *J.Appl.Phys.* **92**, 1292 (2002).
40. Formation of Single Phase CuO Quantum Particles
Kavita Borgohain, and Shailaja Mahamuni, *J.Materials Research* **17**, 1220 (2002).
39. Highly Photoluminescent ZnSe/ZnS Quantum Dots
V.V. Nikesh, and Shailaja Mahamuni,
Semiconductor Science and Technology **16**, 687 (2001).
38. Unpinning of Surface State at 0.92 eV by Nanocrystalline ZnSe on GaAs
S.S. Hullavarad, V.V. Nikesh, S.R. Sainkar, V. Ganesan, S. Mahamuni, and S.V. Bhoraskar,
Thin Solid Films **381**, 69 (2001).
37. Quantum Size Effects in CuO Nanoparticles
K. Borgohain, J.B. Singh, M.V. Rama Rao, T. Shripathi, and Shailaja Mahamuni,
Phys.Rev.B **61**, 11093 (2000).
36. Photophysical Properties of ZnS Nanoclusters.
N.R. Kumbhojkar, V.V. Nikesh, A. Kshirsagar and Shailaja Mahamuni,
J.Appl.Phys. **88**, 6260 (2000).
35. Optical Phonon Confinement in Zinc Oxide Nanoparticles.
M. Rajalakshmi, A.K. Arora, B.S. Bendre, and Shailaja Mahamuni,
J.Appl.Phys. **87**, 2445 (2000).
34. Spectroscopic Characterization of Electrochemically Grown ZnO Quantum Dots
Shailaja Mahamuni, Kavita Borgohain, B.S. Bendre, V.J. Leppert, and S.H. Risbud,
J.Appl.Phys. **85**, 2861 (1999).
33. Studies on Third Harmonic Generation in Chemically Grown ZnS Quantum Dots.
A.K. Dharmadhikari, N.R. Kumbhojkar, J.A. Dharmadhikari, S. Mahamuni, and R.C. Aiyer,
J.Phys.: Condensed Matter **11**, 1363 (1999).
32. Radiation Induced Synthesis and Characterization of Copper Nanoparticles.

- S.S. Joshi, S.F. Patil, V. Iyer, and Shailaja Mahamuni,
Nanostructured Materials **10**, 1135 (1999).
31. Luminescence Behavior of Chemically Grown ZnO Quantum Dots
Kavita Borgohain and Shailaja Mahamuni,
Semiconductor Science and Technology **13**, 1154 (1998).
 30. Quantum Confinement Effects in Chemically Grown, Stable ZnSe Nanoclusters
N.R. Kumbhojkar, Shailaja Mahamuni, V.J. Leppert and S.H. Risbud,
Nanostructured Materials **10**, 117 (1998).
 29. ZnSe Quantum Dots Synthesized in a Polymeric Matrix
V.J. Leppert, Shailaja Mahamuni, N.R. Kumbhojkar and S.H. Risbud,
Materials Science and Engineering **B52**, 89 (1998).
 28. ZnO Nanoparticles Embedded in Polymeric Matrices.
Shailaja Mahamuni, B.S. Bendre, V.J. Leppert, C.A. Smith, D. Cooke, S.H. Risbud, and
H.W.H. Lee, Nanostructured Materials **7**, 659 (1996).
 27. Studies on BaO Particles in Nanosize Regime.
Shailaja Mahamuni, B.S. Bendre, T. Baruah, A. Kshirsagar, S.S. Joshi, A.G. Bedekar,
S.F. Patil, P. Singh, K. Maiti, and D.D. Sarma, Nanostructured Materials **7**, 557 (1996).
 26. Doping Induced Changes in the Physical Properties of $\text{In}_2\text{O}_3:\text{Sn}$ Films.
C. Agashe and Shailaja Mahamuni, Semiconductor Science and Technol. **10**, 172 (1995).
 25. Thiophenol Capped ZnS Quantum Dots.
Shailaja Mahamuni, Ali Khosravi, M. Kundu, A. Kshirsagar, A. Bedekar, D.B. Avasare,
P. Singh and S.K. Kulkarni, J. Appl. Phys. **73**, 5237 (1993).
 24. Effect of Indium Doping on the Physical Properties of Sprayed ZnO Films.
D.J. Goyal, C. Agashe, M.G. Takwale, V.G. Bhide, Shailaja Mahamuni and S.K. Kulkarni,
J. Mater. Res. **8**, 1052 (1993).
 23. The Study of Pulsed Laser Deposited Films From a Pressed Sintered, W-C Mixture at Two
Different Fluences.
S. Ghaisas, R.D. Vispute, S.B. Ogale, S.M. Chaudhari, S.M. Kanetkar, S.K. Kulkarni,
Shailaja Mahamuni, S. Badrinarayan and S.V. Ghaisas, J. Mater. Res. **7**, 3250 (1992).
 22. Reactivity and Surface Modification at a $\text{Bi}/\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ Interface.
P.S. Asoka Kumar, Shailaja Mahamuni, A.S. Nigavekar and S.K. Kulkarni,
Physica C **201**, 145 (1992).
 21. Chemical Reactivity and Band Offset at CdS/Si Interface
M. Kundu, Shailaja Mahamuni, S. Gokhale, A.S. Nigavekar and S.K. Kulkarni,
Appl. Surf. Sci. **68**, 95 (1993).
 20. Interfacial Behaviour of $\text{Ti}/\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ system
P.S. Asoka Kumar, Shailaja Mahamuni, A.S. Nigavekar and S.K. Kulkarni,
J. Appl. Phys. **71**, 2783 (1992).
 19. Effect of Sn incorporation on the Growth Mechanism of Sprayed SnO_2 Films.
C. Agashe, M.G. Takwale, V.G. Bhide, Shailaja Mahamuni and S.K. Kulkarni,
J. Appl. Phys. **70**, 7283 (1991).

18. Thulium/Silicon Interface Formation
S. Gokhale, Shailaja Mahamuni, K. Joshi, A.S. Nigavekar and S.K. Kulkarni,
Surf. Sci. **257**, 187 (1991).
17. Photoemission and X-ray Diffraction Study of Er/Si (111) Interface.
S. Gokhale, Shailaja Mahamuni, S.V. Deshmukh, V.J. Rao, A.S. Nigavekar
and S.K. Kulkarni, Surf. Sci. **237**, 127 (1990).
16. Non Reactive Sb/Bi₂Sr₂CaCu₂O₈ Interface.
P.S. Asoka Kumar, Shailaja Mahamuni, A.S. Nigavekar and S.K. Kulkarni,
Solid State Commun. **75**, 451 (1990).
15. Photoelectron Spectroscopic Studies of the Interface Reactions Between Lead and High Tc
Bi₂Sr₂CaCu₂O₈ Superconductor.
P. Kulkarni, Shailaja Mahamuni, S.K. Kulkarni and A.S. Nigavekar,
Physica C. **168**, 104 (1990).
14. Photoelectron Spectroscopic Studies on Silicon Interface with Bi₂Sr₂CaCu₂O_{8+δ}
Superconductor.
P. Kulkarni, Shailaja Mahamuni, A.S. Nigavekar, M. Chandrachood, I.S. Mulla,
A.P.B. Sinha and S.K. Kulkarni, J. Appl. Phys. **67**, 3438 (1990).
13. Room Temperature Reaction of Ni/Bi₂Sr₂CaCu₂O₈ Interface.
P.S. Asoka Kumar, Shailaja Mahamuni, P. Kulkarni, I.S. Mulla, M. Chandrachood, A.P.B.
Sinha, A.S. Nigavekar and S.K. Kulkarni, J. Appl. Phys. **67**, 3184 (1990).
12. Reactivity of Bi-Sr-Ca-Cu-O Superconductor Surface with Indium Studied by Photoelectron
Spectroscopy, P. Kulkarni, Shailaja Mahamuni, M. Chandrachood, I.S. Mulla,
A.S. Nigavekar, A.P.B. Sinha and S.K. Kulkarni, Appl. Phys. Lett. **54**, 2262 (1989).
11. XPS and XRD Investigations of Dy/Si Interface
S. Gokhale, N. Ahmed, Shailaja Mahamuni, V.J. Rao, A.S. Nigavekar and S.K. Kulkarni,
Surface Science **210**, 85 (1989).
10. Defect Sensitivity of the Growth of Nb on Si (111).
Shailaja R. Mahamuni, Dan T. Abell and Ellen D. Williams,
Solid State Commun. **68**, 145 (1988).
09. Field Assisted Chemiplating of Cu₂S Films for CdS/Cu₂S Heterostructure.
Shailaja Kolhe, S.K. Kulkarni, M.G. Takwale and V.G. Bhide,
J. Material Science Letters, **6**, 44 (1987).
08. Growth Mechanism of Topotaxially Grown Cu₂S Films on Sprayed CdS Films.
Shailaja Kolhe, B.S. Bendre, S.K. Kulkarni, M.G. Takwale and V.G. Bhide,
J. Crystal Growth **82**, 303 (1987).
07. Effect of Laser Annealing on Spray Deposited CdS Films.
Shailaja Kolhe, V.J. Hasabnis, S.K. Kulkarni, M.G. Takwale, B.R. Marathe and V.G. Bhide,
J. Material Science Letters **6**, 49 (1987).
06. Influence of Process Parameters on Electrical Transport Mechanism in Sprayed CdS Films.
Shailaja Kolhe, S.K. Kulkarni, M.G. Takwale, B.R. Marathe and V.G. Bhide,
Solar Energy Materials **15**, 189 (1987).
05. X-ray Photoelectron Spectroscopic Studies of Sprayed CdS Films.

Shailaja Kolhe, S.K. Kulkarni, A.S. Nigavekar and V.G. Bhide, J. Mat. Sci. **22**, 1067 (1987).

04. Electrical Transport Phenomena in Sprayed CdS films.

Shailaja Kolhe, S.K. Kulkarni, M.G. Takwale and V.G. Bhide,
Solar Energy Mat. **13**, 203 (1986).

03. Evidence of SO₂ Formation on CdS.

P. Karve, A.K. Khasbag, Shailaja Kolhe, A.S. Nigavekar and S.K. Kulkarni,
Indian J. of Pure and Appl. Phys. **23**, 174 (1985).

02. Effect of Air Annealing on Chemically Deposited CdS Films by XPS and XRD.

Shailaja Kolhe, S.K. Kulkarni, A.S. Nigavekar and S.K. Sharma,
Solar Energy Materials **10**, 47 (1984).

01. Effect of Argon Ion Bombardment on CdS Thin Films

Shailaja Kolhe, S.K. Kulkarni and A.S. Nigavekar,
Indian J. Pure and Appl. Phys. **22**, 128 (1984).