

Bio-data of Dr. Aman Mahajan

Name	Aman Mahajan
Date & Place of Birth	October 03,1974 (Gurdaspur, Punjab)
Nationality	Indian
Present affiliation	Assistant Professor in Physics Department of Physics, Guru Nanak Dev University, Amritsar-143005. India E-mail: dramanmahajan@yahoo.co.in Phone No. 91-183-2258802-09, Ext. 3470; 91-9417932547 (M)
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Academic Qualifications: M.Sc. (Physics) Gold Medallist, Ph. D.,

Year	Degree	University/Institution
1992-1995	B.Sc.	G.N.D. University, Amritsar
1995-1997	M.Sc. (Gold Medallist)	G.N.D. University, Amritsar
1998-2003	Ph.D.	G.N.D. University, Amritsar

Positions held:

Year(s)	University/Institution	Position held
July 1, 2002- June 30, 2004	D.A.V. College, Amritsar	Lecturer
July 1, 2004-Feb. 25, 2009	D.A.V. College, Amritsar	Senior Lecturer
Feb. 26, 2009-till date	G.N.D. University, Amritsar	Assistant Professor

Field of Specialisation: Materials Science specializing in device-oriented research leading to organic photovoltaic, organic light emitting and gas sensor

Teaching Experience: PG & UG level: Eight years and eight months

Research Experience:

- Twelve years research experience in Material Science laboratory at Department of Physics, GNDU, Amritsar, Microelectronics Instruments Division, Central Scientific Industrial Organization, Chandigarh and DAV College, Amritsar.

Research Expertise:

Preparation and characterization of thin films, Fabrication of multi-layered devices for photovoltaic and light emitting devices, gas sensors, atomic force microscopy, two-probe and four-probe measurements of electrical resistivity as a function of temperature, X-ray diffraction, FTIR, UV-VIS and Fluorescence spectroscopy.

Research paper published: 30

Research papers presented in various International / National Conferences: 12

Number of Books written: 2

Research students supervised/ supervising:

Ph.D.: 4

M.Phill: 2

M.Sc. : 10

Ph.D. students supervising:

Name	Topic
Kamalpreet Khun Khun (Registered)	Preparation and characterization of nanostructured tin oxide for gas sensing applications
Raman Preet Aulakh (Enrolled)	Design and development of functionalised phthalocyanine materials for light emitting and gas sensing applications
Navdeep Sharma (Enrolled)	Nanostructured materials for space settlements
Mandeep Singh (Enrolled)	Fabrication of improved organic light emitting diodes using anthracene derivatives

Research Project completed / Undertaken: 7

S.No.	Title	Funding Agency	Duration	Grant
1.	Antracene based blue emitters for organic light emitting devices	CSIR, New Delhi	2011-2014	Rs. 22.3 Lacs
2.	Design and development of functionalised phthalocyanine materials for light emitting and gas sensing applications	DAE-BRNS, Mumbai	2010-2013	Rs. 19.96 Lacs
3.	Design and synthesis of substituted triazoles for light emitting applications	DST, New Delhi	2010-2013	Rs. 17.00 Lacs
4.	Development of Metal Oxide Based Nanostructured Materials For Device Applications	DAE-BRNS, Mumbai	2009-2012	Rs. 23.02 Lacs
5.	Swift heavy ion irradiation induced modification in structural, electrical and optical properties of SnO ₂ films	IUAC-UGC, New Delhi	2008-2011	Rs. 3.63 Lacs
6.	Phthalcyanines Based Materials For Molecular Electronic Devices	CSIR, New Delhi	2006-2010	Rs. 11.5 Lacs
7.	Phthalcyanines-Materials For Molecular Electronic Devices	UGC, New Delhi	2005-2007	Rs. 80000/-

Objectives and Achievements of research projects:

1. Design and development of functionalised phthalocyanine materials for light emitting and gas sensing applications

Objectives:

- To design and synthesize new functionalized octa-/tetra- substituted phthalocyanine molecules.
- To fabricate organic light emitting devices out of selected samples by using phthalocyanine based material as hole injecting layer (HIL) or hole transporting layer (HTL).
- To fabricate gas sensors out of the selected films and to study their electrical and optical responses in presence of various gases.

Instruments:

Fluorescence facility has been created in the department under this project.

Results:

Thin films of copper(II) 1,4,8,11,15,18,22,25-octabutoxy-29H,31H-phthalocyanine have been prepared and tested for chlorine gas sensing. The sensing results show that these films are highly selective to chlorine gas and few ppb level of this gas can be sensed even at room temperature. Now, we are aiming to synthesize water soluble phthalocyanine to fabricate nano porous structure for the development of highly sensitive gas sensors.

- *R. K. Bedi, Rajan Saini, Aman Mahajan
Room temperature ppb level chlorine gas sensor based on
copper(II)1,4,8,11,15,18,22,25-octabutoxy-29H,31H-phthalocyanine films
AIP Conference Proceedings,1313 (2010) 205*

2. Design and synthesis of substituted triazoles for light emitting applications

Objectives:

- To design and synthesize new efficient electron transport (ET) materials based on functionalized triazole derivatives and their conversion into thin films.
- To study their thermal, structural, photophysical, electrochemical and electrical properties.
- To fabricate improved layered structured organic light emitting devices out of selected ET materials.

Instruments:

Dual Source Meter 200V- Keithley will be procured under this project.

Results:

1-Phenyl-3-(4-phenyl-[1,2,3]triazol-1-yl)-4-styryl-azetid-2-one molecule has been synthesised and their thermally evaporated films show the formation of well-ordered films and exhibit emission in 694-696 nm. An increase in emission is also found in case of films deposited at higher substrate temperature. At present we are fabricating multi-layered OLED using this molecule.

- *Aman Mahajan, R. K. Bedi, Pardeep Singh and Vipan Kumar
Synthesis and characterization of 1-phenyl-3-(4-phenyl-[1,2,3]triazol-1-yl)-4-
styryl-azetid-2-one films for light emitting applications
Thin Solid Films, 519(2010)1501*

3. Development of Metal Oxide Based Nanostructured Materials For Device Applications

Objectives:

- To synthesise and characterize metal oxide nanostructured materials by using sol-gel method.
- To prepare metal-semiconductor nanocomposites by doping metals and to characterize them.
- To study the effect of swift heavy ion irradiation in metal oxides nanostructures to tune the optical band gap and carrier density.
- To identify and develop improved devices namely gas sensors and optoelectronics.

Instruments:

Atomic Force Microscope (AFM) had been procured under this project.

Results:

Metal oxides namely chromium and tin oxide have been prepared using sol gel technique. Particle of 2-3 nm size are found in these samples. Room temperature chemiresistive gas sensor based on chromium oxide has been fabricated and shows large selectivity to ammonia gas at ppb level.

- *Vishal Balouria, Ajay Singh, D. K. Aswal, Aman Mahajan, R. K. Bedi and J. V. Yakhmi*

Room temperature ammonia chemiresistive sensor based on chromium oxide films

Sensors and Actuators B: Chemical, B147 (Submitted) 2010

4. Swift heavy ion irradiation induced modification in structural, electrical and optical properties of SnO₂ films

Objectives:

- To prepare films of SnO₂ by spin coating and spray pyrolysis under different experimental conditions and to study their structural, optical and electrical characteristics.
- To tune the band gap and carrier density in these materials using SHI irradiation.
- To identify and develop gas sensor out of the selected films.

Results: Pure, Sb doped and surfactant assisted SnO₂ have been synthesized and studied both in thick and thin film form for ammonia sensing. The particle size found to play crucial role in controlling the gas sensitivity. Surfactant assisted grown SnO₂ based sensors show an almost 10² times increase in the response towards ammonia.

- *Kamalpreet Khun Khun, Aman Mahajan and R. K. Bedi*
Effect of cationic/anionic organic surfactants on evaporation induced self assembled SnO₂ nanostructured films
Applied Surface Science, 257(2011)2929
- *Nanostructured Sb doped SnO₂ thick films for room temperature NH₃ sensing applications*
Chemical Physics Letters, 492(2010) 119
- *SnO₂ thick films for room temperature gas sensing applications*

5. Phthalocyanine based materials for molecular electronic devices

Objectives:

- To design and synthesize functionalized phthalocyanine derivatives.
- To prepare and characterize the films of newly designed phthalocyanine molecules.
- To identify and develop solar cells out of the selected films.

Instruments: Spin coating unit has been procured under this project.

Results: Functionalized phthalocyanine have been synthesized and studied in thin film form. Nanostructured films of silver phthalocyanine has been prepared and photovoltaic device based on these show an increase of 100 time in photo-conversion efficiency as compare to their copper counterparts.

- *Himani Gupta, Aman Mahajan and R. K. Bedi*

Synthesis and Characterization of silver phthalocyanine nanowires and nanobelts

The European Physical Journal of Applied Physics 42(2008) 81

- *Silver Phthalocyanine films for photovoltaic applications*

Atti Della "Fondazione Giorgio Ronchi", Anno LXIV, 2009-N.4 (2009) 597

6. Phthalcyanines-Materials For Molecular Electronic Devices

Objectives:

- To prepare and characterize films of copper phthalocyanine molecule.
- To identify and develop improved devices out of these.

Results: Copper phthalocyanine films have been deposited using thermal evaporation and hot wall techniques. Hot wall grown films are found to be more ordered and conducting. Efficiency of hot wall based photovoltaic device is found to be almost 10 times more than thermally evaporated device.

- *Himani Gupta, Aman Mahajan and R. K. Bedi*

Copper phthalocyanine films for photovoltaic applications

Indian Journal of Pure and Applied Physics 46 (2008) 435

Research project recently sanctioned:

Title: Anthracene based blue emitter for organic light emitting devices

Funded by: CSIR, New Delhi

Objectives:

- To design anthracene derivative which can be used as efficient and stable blue emitters for full color organic electroluminescence (EL) devices.

- To prepare films of selected materials by spin coating and thermal evaporation on different substrate under different experimental conditions. To characterize these films for thermal, structural, photophysical, electrochemical and electrical properties.
- To fabricate improved single layer and multilayer organic EL devices using anthracene based blue fluorescent materials and to study their luminescence- voltage (L-V) and current density – voltage(J-V) characteristics.

Professional recognition, awards, fellowships received:

- **Received Young Scientist research project** entitled “Design and synthesis of substituted triazoles for light emitting applications” from DST, New Delhi, India under SERC Fast Track Scheme.
- **Received third prize** for presenting research paper entitled “Study on thermally evaporated 9,10-anthraquinone films” at International Workshop on Preparation and Characterization of Technologically Important Single Crystals, held at National Physical Laboratory, New Delhi, Feb. 2001.
- **First position and Gold Medallist** in Guru Nanak Dev University, Amritsar, India, in M.Sc.(Physics), 1997
- April 1998-March 2000, **Junior Research Fellowship**, awarded by Guru Nanak Dev University, Amritsar, India
- April 2000-June 2002, **Senior Research Fellowship**, awarded by Guru Nanak Dev University, Amritsar, India
- **Life Member** of Electron Microscopy Society of India (EMSI).

References:

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List of Publications

Books

1. **Mechanics**, (2007), Randhir Singh and **Aman Mahajan**, Kalyani Publishers, India. (ISBN No. 978-81-272-3824-7)
2. **Material Science**, (2007), **Aman Mahajan** and Himani Gupta, Kalyani Publishers, India. (ISBN No. 978- 81-272-3831-5).

In International Journals

1. Kamalpreet Khun Khun, **Aman Mahajan** and R. K. Bedi
Effect of cationic/anionic organic surfactants on evaporation induced self assembled SnO₂ nanostructured films
Applied Surface Science, 257(2011)2929
2. **Aman Mahajan**, R. K. Bedi, Pardeep Singh and Vipin Kumar
Synthesis and characterization of 1-phenyl-3-(4-phenyl-[1,2,3]triazol-1-yl)-4-styryl-azetidin-2-one films for light emitting applications
Thin Solid Films, 519(2010)1501
3. Rajan Saini, **Aman Mahajan**, R.K. Bedi and Subodh Kumar
Synthesis and characterization of nanostructured 1,3-bis(1-anthracenylazomethine) benzene films for room temperature NH₃ gas sensing applications
Sensors and Actuators B: Chemical, B147((2010) 122
4. Kamalpreet Khun Khun, **Aman Mahajan** and R. K. Bedi
Nanostructured Sb doped SnO₂ thick films for room temperature NH₃ sensing applications
Chemical Physics Letters, 492(2010) 119
5. **Aman Mahajan**, Sukhwinder Singh Brar and R. K. Bedi
Characterization of hot wall grown 9,10-dichloroanthracene films for light emitting applications
AIP Conference Proceedings,1313 (2010) 156
6. R. K. Bedi, Rajan Saini, **Aman Mahajan**
Room temperature ppb level chlorine gas sensor based on copper(II)1,4,8,11,15,18,22,25-octabutoxy-29H,31H-phthalocyanine films
AIP Conference Proceedings,1313 (2010) 205
7. Kamalpreet Khun Khun, **Aman Mahajan** and R. K. Bedi
SnO₂ thick films for room temperature gas sensing applications
Journal of Applied Physics, 106 (2009) 124509
8. Himani Gupta, **Aman Mahajan** and R. K. Bedi
Silver Phthalocyanine films for photovoltaic applications
Atti Della "Fondazione Giorgio Ronchi", Anno LXIV, 2009-N.4 (2009) 597
9. R. K. Bedi, S. S. Brar, Navneet Kaur, Subodh Kumar and **Aman Mahajan**
Characterization of hot wall grown N-9-anthracenylidene-1-anthramine films
Zeitschrift für Kristallographie 27(2008)169
10. Himani Gupta, **Aman Mahajan** and R. K. Bedi
Synthesis and Characterization of silver phthalocyanine nanowires and nanobelts
The European Physical Journal of Applied Physics 42(2008) 81
11. Himani Gupta, **Aman Mahajan** and R. K. Bedi
Characterization of hot wall grown silver Phthalocyanine films

Journal of Applied Physics, 102 (7), (2007) 73502

12. **Aman Mahajan** and R.K.Bedi
Study on hot wall epitaxy grown 9,10-anthraquinone films
SPIE, 5062 (2003) 61
13. **Aman Mahajan**, R. K. Bedi, Pramila and Subodh Kumar
Characterization of hot wall epitaxy grown 1-(2-methoxy benzyloxy)-8-hydroxy-9,10-anthraquinone films
Thin Solid Films, 420-421 (2002)387
14. **Aman Mahajan**, R. K. Bedi, Pramila and Subodh Kumar
Characterization of thermally evaporated 1,8-diacetoxy-9,10-anthraquinone films
Thin Solid Films, 398-99(2001)82
15. **Aman Mahajan**, R.K.Bedi and Subodh Kumar.
Structural, optical and electrical characterization of hot wall epitaxy grown 1- methoxy,8-hydroxy-9,10-anthraquinone Films
Journal of Applied Physics, 89(2001)7866
16. **Aman Mahajan**, Amarjit Singh, Rajesh Kumar, R.K.Bedi, Pramila and Subodh Kumar.
Characterization of 1,4-/1,8- dihydroxy-9,10-anthraquinone Films
Thin Solid Films, 385(2001)36
17. Amarjit Singh, Rajesh Kumar, **Aman Mahajan** and R.K.Bedi
Electrical Properties of AgInTe₂ Films Grown by Hot Wall Epitaxy
SPIE, 3975(2000)1345.

Referral Journals/ Proceedings of the Conferences

18. Rajan Saini, **Aman Mahajan** and R. K. Bedi
Spin coated Cu(II) octabutoxy phthalocyanine films for light emitting applications
Proc. DAE Solid State Physics Symposium, (2009) 611
19. Sukhwinder Singh Brar, **Aman Mahajan** and R. K. Bedi
Structural and optical characterization of hot wall grown 9-chloro-anthracene films
Proc. DAE Solid State Physics Symposium, (2009)579
20. Himani Gupta, Aman Mahajan and R. K. Bedi
Copper phthalocyanine films for photovoltaic applications
Indian Journal of Pure and Applied Physics 46 (2008) 435
21. Himani Gupta, **Aman Mahajan** and R. K. Bedi
Preparation and Characterization of silver phthalocyanine based optoelectronic devices
Proc. DAE Solid State Physics Symposium, (2008)781
22. Himani Gupta, Aman Mahajan and R. K. Bedi
Characterization of hot wall grown silver phthalocyanine films for device applications
Proc. of International Conference on Intelligent Systems and Networks, (2007) 404
23. Himani Gupta, **Aman Mahajan** and R. K. Bedi

- Electrical and Photovoltaic studies in copper phthalocyanine based sandwich devices
Proc. DAE Solid State Physics Symposium, (2007) 419
24. Himani Gupta, Aman Mahajan and R. K. Bedi
Synthesis and Characterization of silver phthalocyanine nanowires
Proc. DAE Solid State Physics Symposium, (2006) 277
25. Himani Gupta, **Aman Mahajan** and R. K. Bedi
Structural and optical characterization of hot wall grown copper phthalocyanine films
Proc. DAE Solid State Physics Symposium (2005) 421
26. R. K. Bedi and **Aman Mahajan**
9,10-Anthraquinone based organic semiconducting materials
Proc. DAE Solid State Physics Symposium (2004) 45
27. **Aman Mahajan** and R. K. Bedi
Study on thermally evaporated 9,10-anthraquinone films
Crystal Growth and Characterization: Proceedings of International Workshop on preparation and characterization of technologically important single crystals held at NPL, New Delhi, Eds. S. K. Gupta, S. K. Halder and G. Bhagvannaryana (2001)558
28. **Aman Mahajan**, Amarjit Singh, Rajesh Kumar, R.K.Bedi and Subodh Kumar.
Optical absorption studies on 1,4-/1,8-dihydroxy-9,10-anthraquinone films
Indian Journal of Engineering and Material Sciences,7(2000)399.
29. Rajesh Kumar, Amarjit Singh, **Aman Mahajan**, R.K.Bedi and T. Singh.
Characterization of thermally evaporated AgGaTe₂ Films
Indian Journal of Engineering and Material Sciences,7 (2000)411.
30. Transport Properties of Vacuum deposited AgInTe₂ Films
Amarjit Singh, Rajesh Kumar, **Aman Mahajan**, R.K.Bedi and Taminder Singh
Semiconductors Materials: Proceedings of National Seminar on Characterization of Semiconductors for device applications held at GNDU, Amritsar, Ed. R. K. Bedi,
(1998)211

Abstracts/ Papers presented in international and national conferences

1. Paper entitled “**Effect of cationic surfactant on the sensing behaviour of nanocrystalline CuO films deposited by spray pyrolysis**”
has been presented at International Conference on Metallurgical coatings and thin films (ICMCTF-2010), held at San Diego, California, USA during April 26-30, 2010.
2. Paper entitled “**Synthesis and Characterization of spin coated substituted amines films for light emitting applications**”
has been presented at “National Conference on Material Science & Technology: Emerging Trends: NCMST-10” held at DAV College, Jalandhar, India, during Oct. 23, 2010

3. Paper entitled “**Preparation and characterization of spin coated copper phthalocyanine films**” has been presented at “International symposium on Nanostructured Materials: Structure, Properties and Applications” held at KMV college, Jalandhar during Oct. 28-29, 2009
4. Papers entitled “**Characterization of spin coated zinc-2,3,9,10,16,17,23,24-octakis(octyloxy)-29H, 31H-phthalocyanine films for room temperature NH₃ gas sensing applications**” and “**Nanostructured silver phthalocyanine films for photovoltaic applications**” have been presented at “Homi Bhabha Centenary BRNS-GND University Workshop on Molecular/Organic Electronic Devices(MOED-2009)” held at Guru Nanak Dev University, Amritsar during Sept. 22-25, 2009.
5. Paper entitled “**Silver phthalocyanine films grown by hot wall epitaxy technique for photovoltaic applications**” has been presented at “National Conference on Advances in Instruments” held at AIET, Faridkot, during July 17-19, 2009
6. Paper entitled “**Characterization of anthraquinone based films for light emitting applications**” has been presented in “National Conference on Recent Trends in Material Sciences” held at DAV College, Amritsar during Feb.10-11, 2009.
7. Paper entitled “**Silver phthalocyanine films for photovoltaic applications**” has been presented in “National Conference on emerging trends in engineering materials” held at Thapar Institute of Engineering & Technolgy, Patiala during Feb. 1-3, 2007
8. Paper entitled “**Characterization of hot wall grown 1,4-dihydroxy-9,10-anthraquinone films for schottky barrier devices**” has been presented in “National Conference on Advanced Materials & Technology” held at DAV College, Amritsar during Sept. 24-26, 2004.
9. Paper entitled “**Structural, optical and photovoltaic studies on Schottky barrier devices using 1,4-dihydroxy-9,10-anthraquinone Films**” has been presented at “National Symposium on Vaccum Science & Technology and Vacuum Metallurgy” held at BARC, Mumbai during Oct. 15-17, 2003.
10. Paper entitled “**Characterization of thermally evaporated Copper Phthalocyanine films**” has been presented at “National Conference on Materials and related Technologies” held at Thapar Institute of Engineering and Technology, Patiala during September 19- 20, 2003.
11. Paper entitled “**Characterization of semiconducting films**” has been presented at XXIV Annual Conference on Electron Microscopy and Allied Fields held at Electron Microscopy of India and Panjab University, Chandigarh during Feb. 9-11, 2001.

