Curriculum Vitae

Pawan Kumar Tyagi

Contact Information:

Associate Professor,
Dept. of Physics,
School of Physical & Mathematical Sciences, Central University of Haryana, Mahendergargh, Haryana, 123031

Mobile: +91-880977457
Email:pawantyagi@cuh.ac.in
pawankumartyagi@gmail.com
Skype ID : pawankumartyagi@gmail.com

AREAS OF INTEREST

Gas and Bi-sensor, Hetrojunction Si solar cell, Photovotaics, Photocatlysts, 2D materials, Carbon nanotubes: field emitters, graphene synthesis, HPHT diamonds, single crystal diamond, Ion and electron irradiation

EDUCATIONAL BACKGROUND

- **Ph.D. (Condensed matter Physics):** Department of Physics, Indian Institute of Technology, Mumbai **(July 2006)**. "Synthesis of nickel and cobalt filled multi-walled carbon nanotubes and their detailed structure analysis".

- **M.Sc. (Condensed Matter Physics):** Banaras Hindu University, Banaras, India **(July 2000)**.

ACADEMIC, INDUSTRIAL AND RESEARCH EXPERIENCE

- **DTU** (Dept. of Applied Physics, Delhi Technological University, Delhi) **(July 2010-to till date) as a *Assistant Professor: In DTU,*** *I have developed Nano Fabrication Lab (NFL) at DTU was established to boost the on-going research activity in carbon material like diamond, carbon nanotube and graphene. In NFL,*

primary emphasis is on vapor-deposited materials such as graphene, MoS_2 and CNT; as well as relevant natural and synthetic diamond research and characterization. In NFL research activities is focus on both fundamental and technological aspects of synthesis, characterization, properties, devices and generic applications of carbon materials

- **Center of Nanoscience & Technology)** (Dept. of Applied Physics, Delhi Technological University, Delhi) (**July 2010- December 2015) as Coordinator**

- **Institute of Physics (IOP) Bhubaneswar, India:** (**Nov. 2008- July. 2009: 9 Months)**, ***Post Doctoral Fellow***. *Role and responsibility: I was responsible to synthesis of carbon nanotubes and for operating Transmission Electron Microscope (TEM) to characterize the diamond thin films.*

- **IPCMS (**Institut de Physique et Chimie des Matériaux de Strasbourg, France), (**Oct. 2008- Sept. 2009: 1 Year)**, ***Post Doctoral Fellow***. *Role and responsibility: I was responsible to synthesis of carbon nanotubes and for operating Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM).*

- **KU** (Department of electrical engineering, Korea University, Seoul, South Korea) **(Jan. 2008-Sept. 2008: 8 Months)**, ***Research Professor:*** *Role and responsibility: I was responsible to synthesis of carbon nanotubes and characterized using Micro-Raman spectrometer, Photoluminescence, FTIR spectrometer and X-ray diffraction.*

- **Nozomi Technotron Pte. Ltd, (March 2006-Dec. 2007: 1Year, 9 Months),** ***Technical Manager***. *Role and responsibility: Key objective of R & D activities was to develop rational procedure to grow diamond of Carat weight 2, Color grade: E-G, Clarity: VVS1. As per requirement recipe was tuned and modified to make diamond.*

- **IIT Bombay (Indian Institute of Technology Bombay, Mumbai) (July 2001-April 2006):** ***Teaching Assistant*** for undergraduate courses (B.Tech) & Post graduate curses (M.Sc).

LIST OF ONGOING AND COMPLETED PROJECTS

1. **Synthesis of Structural Defects Free Single Layer Graphene** for Applications in Nanoelectronic Devices, SR/FTP/PS-055/2012, Rs. 27.10 Lacs, DST- Fast Track, : **Ongoing (2013-16)**

   Phy/Fast Track Researc Proposal/13-14/115

2. **Graphene-Based Flexible, Transparent Electrodes For Organic Light Emitting diodes and Photovoltaics** under Indo-Portuguese Programme of Cooperation in Science and Technology**, Rs. 5.30 Lacs**: **Ongoing (2013-16)**

   DTU/2013/Phy/Graphene-Based/173

3. **Production of single crystal diamond for jewellery**, Total amount: Rs. 1,103,000.00/year, sponsored by C6 TECHNOLOGIES, Sachin, Surat-394230, Gujarat, **Completed (2010-11)**

   F.No. DTU/CONS/ProJ/AP/2011/101/1076-79

4. **Ion irradiation on filled-multiwalled carbon nanotubes to create N-V center**, (BTRNo. 61306) Ref: IUAC/XIII.3A dated on 12-1-2017)**: Sanctioned**

5. **Study of the chemical structure and bonding in CuO nanowire by using EXAFS Synchrotron radiation**, (Ref:CSR-IC-BL-78/CRS-195/2016-17/859 dated on 28-10-2016: **Sanctioned 2017**

Patent:

1. GROWTH OF DIAMOND FILM USING THERMAL CVD AT ATMOSPHERIC PRESSURE USING SUGARCANE BAGASSE AS CARBON PRECURSOR AND PROCESS THEREOF, ***Pawan Kumar Tyagi,*** Lucky Krishnai, Indian patent, Patent No.201711031602, 06/9/2017 (Filed)

Research Guidance: ***2 Post Doctoral Fellow, 20. B.Tech. 15 M.Tech students and 5 Ph.D students Guided.***

Research: **61 paper published in referred international journals)**

- Published **Thirty Eight Research Papers (38) in referred** journal in **past five years (Referred International Journals-33, Conferences-5). Details are tabulated below:**

Research papers	Role			Average/Highest Impact Factor
	Corresponding author	Supervisor	Co-author	
International journal	25	3	5	2.84/7.76
International conference proceeding	2	-	1	
National conference proceeding	1	-	1	

- **Thirteen (13) M.Tech and Five Ph.D. theses have been supervised.**

List of Publications:

62. A critical review of Diamond like Carbon Coating for Wear Resistance Applications, Ankit Tyagi, R.S. Walia, Shailesh Mani Pandey, ***Pawan K. Tyagi,*** Bharat Bajaj, **International Journal of Refractory Metals and Hard Materials**, **2018**

61. Potential application of multi-walled carbon nanotubes/activated carbon/bamboo charcoal for efficient alcohol sensing, Vinay Kumar, ***Pawan K. Tyagi,*** **Journal of Alloys and Compounds, 767 (2018) 215-222**

60. Work function and electrical properties of individual carbon nanotube: influenced by nature of catalyst and substrate, Reetu Kumari, ***Pawan K. Tyagi,*** Nitin K. Puri, **Applied Physics A, (2018) 124:466**

59. Structure, magnetism and electrical transport in epitaxial $La_{0.23}P_{0.41}Ca_{0.36}MnO_3$ thin films: consequences of film thickness, Sandeep Singh, ***Pawan Kumar Tyagi,*** H K Singh, **AIP Advances, 8, 095002 (2018)**

58. Dielectric and absorption properties of as-grown Bilayer and Single layer graphene at the microwave frequencies, Kamlesh Patel, **Pawan K. Tyagi**, **Materials Today: Proceedings** 5 (2018) 15261–15266

57. Few-layer p-type phosphorene sheet: An efficient transparent conducting electrode in silicon heterojunction solar cell, Chandra Kamal Borah, ***Pawan K. Tyagi***, Sanjeev Kumar, Kamlesh Patel, **Computational Materials Science 151 (2018) 65–72**

56. Electrochemical studies of novel olivine-layered ($LiFePO_4$-Li_2MnO_3) dual composite as an alternative cathode material for lithium-ion batteries, Rakesh Saroha & Amrish K. Panwar & Anurag Gaur & Yogesh Sharma & Vinay Kumar ***& Pawan K. Tyagi,*** **J Solid State Electrochem (2018). https://doi.org/10.1007/s10008-018-3963-6**

55. Growth and characterization of polycryalline diamond films on silicon using sugar cane baggasee as carbon precursor by atmospheric pressure chemical vapor deposition, Lucky Krishnia, ***Pawan K. Tyagi,*** **Diamond & Related Materials** 87 (2018) 18–26

54. Electron irradiation induced wall-to-wall joining of multiwalled carbon nanotubes, Reetu Kumari, ***Pawan K. Tyagi,*** Nitin K. Puri, **Applied Surface Science** 453 (2018) 153–158

53. Remarkable Confinement Effect of Nanofiber in Carbon Nanotubes for Dehydrogenative Coupling of Alcohols with α-Diaminobenzene: A New Root for Synthesis of Benzimidazole, Melad Shaikh, Richa Yadav, ***Pawan K. Tyagi***, Lallan Mishra, K. V. S. Ranganath, **ChemNanoMat** 2018, 4, 1 - 5

52. As-pyrolyzed sugarcane bagasse possessing exotic field emission properties, Lucky Krishnia, Brajesh S. Yadav, Umesh Palnitkar, P.V. Satyam, Bipin Kumar Gupta, Nikhil A. Koratkar, ***Pawan K. Tyagi,*** **Applied Surface Science,** 443, (2018), 184-190

51. Facile synthesis of semiconducting ultrathin layer of molybdenum disulfide, Sarvottam K. Jha, Reetu Kumari, Shubham Choudhary, Pushpendu Guha, P V Satyam, Brajesh S. Yadav, Zainab Naqvi, S. S. Kushvaha, R. K. Ratnesh, M. S. Mehta, Aditya Jain, Amrish K. Panwar, Fouran Singh, ***Pawan K. Tyagi,*** **J. Nanosci. Nanotechnol.** 18, 614–622 (2018)

50. Quantifying phase separation in terms of magnetoresistive hysteresis loops in strongly phase-separated manganite thin films, Sandeep Singh, ***Pawan Kumar Tyagi,*** H. K. Singh, **Appl. Phys. A** (2017) 123:677

49. Ion irradiation induced localized sp2 to sp3 hybridized carbon transformation in walls of multiwalled carbon nanotubes, Reetu Kumari, Fouran Singh, Brajesh S. Yadav, Ravinder K Kotnala, Koteswara Rao Peta, ***Pawan K. Tyagi,*** Sanjeev Kumar, Nitin K. Puri**, Nuclear Inst. and Methods in Physics Research B**, 412, (2017) 115-122

48. Optical effective mass of photon in single and bilayer graphene in 10 MHz-26.5 GHz frequency range, Kamlesh Patel, and ***Pawan K. Tyagi,*** **Carbon** 121 (2017) 56-62

47. Potential application of multilayer n-type tungsten diselenide (WSe2) sheet as transparent conducting electrode in silicon heterojunction solar cell, Pranjala Tiwari, Kamlesh Patel, Lucky Krishnia, Reetu Kumari, ***Pawan K. Tyagi***, **Computational Materials Science** 136 (2017) 102–108

46. Filled-carbon nanotubes: 1 D nanomagnets possessing uniaxial magnetization axis and reversal magnetization switching, Reetu Kumari, Anshika Singh, Brajesh S. Yadav, Dipti Ranjan Mohapatra, Arnab Ghosh, Puspendu Guha, P.V. Satyam, Manoj Kumar Singh, ***Pawan K. Tyagi*****, Carbon** 119 (2017) 464-475

45. P-type multilayer graphene as a highly efficient transparent conducting electrode in silicon heterojunction solar cells**,** Kamlesh Patel, and ***Pawan K. Tyagi,*** **Carbon** 116 (2017) 744-752

44. Synthesis and Electrochemical characterization of Graphene nanoflakes and $LiFe_{0.97}Ni_{0.03}PO_4/C$ for lithium ion battery, Rakesh Saroha, Amrish K. Panwar, Akmal R. Farooq, Lucky Krishniya, ***Pawan. K. Tyagi,*** **Ionics (2017)**

43. Charge injection study in large area multilayer graphene as-grown on nickel by using ambient Kelvin probe force microscopy, Igor Bdikin, Dhananjay K. Sharma, Gonzalo Otero, María J. Hortigüela, ***Pawan K. Tyagi,*** Victor Neto1and Manoj Kumar Singh, **Applied Materials Today** 8 (2017) 18–25

42. Single layer graphene possessing anomalous dispersion with exotic microwave transmission and dielectric properties, Kamlesh Patel, ***Pawan K. Tyagi,*** **Journal of Alloys and Compounds,**706 (2017) 250-259

41. Estimation of intrinsic work function of multilayer graphene by probing with electrostatic force microscopy, Anshika Singh, Puspendu Guha, Amrish K. Panwar, ***Pawan K. Tyagi,*** **Applied Surface Science** 402 (2017) 271-276

40. Development of surface functionalized LiFePO4 with ZnO/C hybrid coating as alternative cathode material for lithium ion batteries, Rakesh Saroha; Yogesh K Sharma; ***Pawan K Tyagi***; Sudipto Ghos, Amrish K Panwar, **Applied Surface Science** 394 (2017) 25–36

39. Effective relative permittivity and characteristic impedance of graphene loaded microstrip line by scalar S-parameters, Kamlesh Patel, Neha and ***Pawan K. Tyagi,*** **AIP Conf. Proc. 1728,** 020617 (2016)

38. Synthesis CNTs Particle Based Abrasive Media for Abrasive Flow Machining Process, Sonu Kumar, Q.Murtaza, R.S Walia, S. Dhulla. ***P. K. Tyagi,*** **IOP Conf. Series: Materials Science and Engineering** 115 (2016) 012034

37. Atomic force microscopy studies of homoepitaxial GaN layers grown on GaN template by laser MBE, B. S. Choudhary, A. Singh, S. Tanwar, ***P. K. Tyagi***, M. Senthil Kumar, and S. S. Kushvaha, **AIP Conf. Proc.** 1724, 020120 (2016)

36. Potential application of mono/bi-layer molybdenum disulfide (MoS2) sheet as an efficient transparent conducting electrode in silicon heterojunction solar cells, Rimjhim Chaudhary, Kamlesh Patel, Ravindra K. Sinha, Sanjeev Kumar, ***Pawan K. Tyagi,*** **J. Appl. Phys.**120, 013104 (2016)

35. Exclusive Endothermic Oxidation of Fe_3C-filled Multi Walled Carbon Nanotubes, Lucky Krishnia, Vinay Kumar, Reetu Kumari, Preeti Garg, Brajesh S. Yadav,Ashutosh Rath, Arnab Ghosh, Ravindra K Sinha, Manoj Kumar Singh, ***Pawan K. Tyagi,*** **Adv. Sci. Eng. Med. 2016,** 8, 460.

34. Potential application of carbon nanotube core as nanocontainer and nanoreactor for the encapsulated nanomaterial, ***Pawan K. Tyagi,*** Reetu Kumari, Umananda M Bhatta, J. Raghavendra Rao, Ashutosh Rath, Sanjeev Kumar, P V Satyam, Subodh K. Gautam, Fouran Singh, **NIMB, 2016,**379,181

33. Fe_3C-filled carbon nanotubes: permanent cylindrical nanomagnets possess exotic magnetic properties, Reetu Kumari, Lucky Krishnia, Vinay Kumar, Sandeep Singh, H K Singh, Ravinder K Kotnala, Raghavendra Rao Juluri, Umananda Bhatta, Satyam V Parlapalli, Brajesh Singh Yadav, Zainab Naqvi and ***Pawan K. Tyagi*** **, Nanoscale,** 2016, 8, 4299–4310

32. Influence of Laser Repetition Rate on Structural and Optical properties of GaN layers grown on Sapphire (0001) by Laser Molecular Beam Epitaxy, S. S. Kushvaha, M Senthil Kumar, Brajesh Singh Yadav, ***Pawan K. Tyagi,*** Sunil Ojha, Kamlesh Maurya and B P Singh, **Cryst. Eng. Comm** (2016),18, 744

31. Synthesis of Ni filled multiwalled carbon nanotubes and study of magnetic behaviour, Reetu Kumari, Anshika Singh, Rajesh Kumar, Lucky Krishnia, Vinay Kumar, Nitin K. Puri, ***Pawan K. Tyagi,*** **Adv. Mater. Lett.** (2016) 7(3), 197-200

30. Comparative study of thermal stability of filled and un-filled multiwalled carbon nanotubes, Lucky Krishnia, Reetu Kumari, Vinay Kumar, Anshika Singh, Preeti Garg, Brajesh S. Yadav, ***Pawan K. Tyagi,*** **Adv. Mater. Lett.**(2016), 7(3), 230-234

29. Green route synthesis of silicon/silicon oxide from bamboo,Vinay Kumar, Pranjala Tiwari, Lucky Krishnia, Reetu Kumari, Anshika Singh, Arnab Ghosh**, *Pawan K. Tyagi,*** **Adv. Mater. Lett**. 2016, 7(3), 271-276

28. Electron irradiation induced buckling, morphological transformation, and inverse Ostwald ripening in nanorod filled inside carbon nanotube, Anshika Singh, Reetu Kumari, Vinay Kumar, Lucky Krishnia, Zainab Naqvi, Amrish K Panwar, Umananda M.

Bhatta, Arnab Ghosh, P V Satyam, ***Pawan K. Tyagi,*** **Appl. Surf. Sci,** 360 (2016) 1003–1008

27. Multilayer graphene as a transparent conducting electrode in silicon heterojunction solar cells, Kamlesh Patel, and ***Pawan K. Tyagi,*** **AIP Advances**, 5, 077165 (2015);

26. Effect of phase separation induced supercooling on magnetotransport properties of epitaxial La5/8-yPryCa_3/8MnO_3 (y»0.4) thin film, Sandeep Singh, Geetanjali Sharma, P. K. Siwach, ***Pawan Kumar Tyagi,*** K. K. Maurya and H. K. Singh, **AIP Advances** 5, 027131 (2015)

25. Supercooling transition in phase separated manganite thin films: an electrical transport study, Sandeep Singh, Pawan Kumar, P. K. Siwach, S. T. Lakshmikumar, ***Pawan Kumar Tyagi*** and H. K. Singh , **Applied Physics Letter**, 104, 212403 (2014)

24. Technological advances in a-Si: H/c-Si Heterojunction solar cells, K Patel, ***P K Tyagi***, **International Journal of Renewable Energy Research (IJRER)** 4 (2), 528-538, (2014)

23. New Approaches for the Performance Improvement of Heterojunction and HIT Solar Cells, K. Patel S. Kumar, O.S. Panwar, C. Sreekumar, C.M.S. Rauthan, ***P. Tyagi,*** **Proceeding, 27th European Photovoltaic Solar Energy Conference and Exhibition**, 2648-2652 (2012)

22. Catalytic Action of Gold and Copper Crystals in the Growth of Carbon Nanotubes, ***Pawan K. Tyagi,*** Izabela Janowska, Ovidu Cretu, Cuong Pham-Huu, and Florian Banhart, **J. Nanosci. Nanotechnology**, 11, 1-7, (2011)

21. Parameter window of diamond growth on GaN films by microwave plasma chemical vapor deposition, Dipti Ranjan Mohapatra, Padmnabh Rai, Abha Misra, ***Pawan K. Tyagi***, Brajesh **S**. Yadav, D.S. Misra, **Diamond and Related Materials**,**17,**177 5(2008).

20. Axial buckling and compressive behavior of nickel-encapsulated multiwalled carbon nanotubes, Abha Misra, ***Pawan K. Tyagi***, Padmnabh Rai, Dipti Ranjan Mahopatra, Jay Ghatak, P. V. Satyam, D. K. Avasthi and D. S. Misra**Phys. Rev. *B*, 76,** 014108 (2007).

19. High-pressure behavior of Ni-filled and Fe-filled multiwalled carbon nanotubes H. K. Poswal, S. Karmakar, ***Pawan K. Tyagi***, D. S. Misra, E. Busetto, Surinder M. Sharma, A. K. Sood, **Physica Status Solidi** *(b)* 244 , No. 10 (2007).

18. FTIR spectroscopy of multiwalled carbon nanotubes: A simple approach to study the nitrogen doping, Abha Misra, ***Pawan K. Tyagi,*** Padmnabh Rai and D. S. Misra, **J. Nanosci. Nanotechnology,7,**1820 (2007).

17. Pressure-induced phase transitions in cobalt-filled multiwalled carbon nanotubes**,** S. Karmakar, ***Pawan K. Tyagi,*** D. S. Misra, and Surinder M. Sharma, **Phys. Rev. B 73,** 184119 (2006).

16. Hexagonal diamond synthesis on h-GaN strained films, Abha Misra, **Pawan *K. Tyagi***, Brajesh S. Yadav, Vivek Pancholi, P.Rai, I. D. Samajdar, D. S. Misra, **Applied Physics Letters**, **89,** 071911(2006).

15. Re-orientation of the crystalline planes in confined single crystal nickel nanorods Induced by heavy ion-irradiation**,** Abha Misra, ***Pawan K. Tyagi***, Padmnabh Rai, Jay Ghatak, P.V. Satyam, D.K. Avasthi and D. S. Misra.**Applied Physics Letters, 89,** 091907 (2006).

14. Step Growth in Single-Crystal Diamond Grown by Microwave Plasma Chemical Vapor Deposition, ***Pawan K. Tyagi,*** Abha Misra, K.N. Narayanan Unni, Padmnabh Rai , Manoj K. Singh, Umesh Palnitkar, D. S. Misra, F. Le Normand, Mainak Roy, S.K. Kulshreshtha, **Diamond and Related Materials**, **15**, 304 (2006).

13. FTIR Studies of Nitrogen-Doped Carbon Nanotubes, Abha Misra, ***Pawan K. Tyagi***, M. K. Singh and D. S. Misra, **Diamond and Related Materials, 15**, 385 (2006).

12. Structural damage on multiwalled carbon nanotubes and encapsulated single crystal nickel nanorods irradiated with Au +7 ions of 100 MeV, Abha Misra***, Pawan K. Tyagi***, Manoj K. Singh, D. S. Misra, Jay Ghatak, P. V. Satyam and D.K. Avasthi, **Diamond and Related Materials, 15,** 300 (2006).

11. Melting of CVD diamond lattice under 100 Mev Au+ irradtion and generation of defects, Umesh Palnitlar D. S. Misra, ***Pawan K. Tyagi***, V.S. Shirodkar, E. Titus, D. K. Avasthi and P. Ayyub, **Thin Solid Films, 503**, 121 (2006).

10.Thermogravimetric analysis of cobalt-filled carbon nanotubes deposited by chemical vapour deposition, Babu P. Ramesh, W.J. Blau, ***P.K. Tyagi***, D.S. Misra, N. Ali, J. Gracio, G. Cabral, E. Titus,**Thin Solid Films**, 494,128(2006).

9. High-resolution transmission electron microscopy mapping of nickel and cobalt single crystalline rods inside multiwalled carbon nanotubes and chirality calculations**. *Pawan K. Tyagi,*** Abha Misra, Manoj K. Singh, D. S. Misra, Jay Ghatak, P. V. Satyam, F. Le Normand, **Appl. Phys. Lett. 86**, 253110 (2005).

8. Single crystalline nickel nanorods inside carbon nanotubes: their growth behavior, structure and magnetic properties***, Pawan K. Tyagi***, Abha Misra, Manoj K.Singh, E. Titus, D. S. Misra, Jay Ghatak, P. V. Satyam, Mainak Roy, **Journal of Nanoscience and Nanotechnology**, **5**, 596 (2005).

7. Quantitative analysis of hydrogen in chemical vapor deposited diamond films, E. Titus, D.S. Misra, A.K. Sikder, ***P.K. Tyagi***, M.K. Singh, Abha Misra, N. Ali, G. Cabral, V.F. Neto and J. Gracio, **Diamond and related materials14**, 476 (2005)

6. Preparation of Ni-filled carbon nanotubes for key potential applications in nanotechnology***, Pawan K. Tyagi***, M. K. Singh, Abha Misra, N. Kumar, D. S. Misra, E. Titus, N. Ali, J. Gracio, M. Roy and A. K. Dua, **Thin Solid Films**, **469**, 127 (2004)

5. Growth of (100) oriented diamond grains by the application of lateral temperature gradients across silicon substrates, E. Titus, D. S. Misra, Manoj. K. Singh, ***Pawan. K. Tyagi***, Abha Misra, F. Le Normand, J. Gracio and N. Ali, **Journal of Materials Research**, **19**, 3206 (2004).

4. Ni and Ni/Pt filling inside multiwalled carbon nanotubes, Manoj K. Singh, E. Titus, ***Pawan K. Tyagi***, U A Palnitkar, D. S. Misra, Mainak Roy, A. K. Dua, C. S. Cojocaru, F. Le Normand, **Journal of Nanoscience and Nanotechnology**, **3**, 165 (2003).

3. Diamond nucleation and growth on zeolites, E. Titus, M. K. Singh, K. N. N. Unni, ***P. K. Tyagi***, A. K. Dua, Mainak Roy and D. S. Misra, **Diamond and Related Materials**, **12**, 1647 (2003).

2. Effect of heavy ion irradiation on self-supported diamond sheets**,** Umesh Palnitkar, V. S. Shirodkar, Manoj K. Singh, Elby Titus, ***P. K. Tyagi***, K. N. Unni, D. S. Misra, P. Ayuub and D. K. Avasthi, **Diamond and Related Materials**, **12**, 1771 (2003).

1. Filling of carbon nanotubes**,** ***Pawan. K. Tyagi***, Manoj. K. Singh. D. S. Misra, Published in **Encylopedia of Nanoscience and Technology (American Scientific Publishers, Edited by Hari Singh Nalwa ,3,** 416 (2003)