Resume

Dr. Shivani Dhall

Assistant Professor
DAV Collage Jalandhar

E-mail: shivani.dhall24@gmail.com
Ph: +91: 8851164015.

Academic Qualification:

Class	Board/University	% of Marks	Division	Year of passing
National Post Doc Fellow	IIT, Delhi	--	--	Aug 2016 to july 2018
Research Associate	IIT, Delhi	--	--	Sept, 2015-Aug, 2016
PhD (Material Science)	NIT, Kurukshetra	9 (SGPA)	---	Sept 2015
M.Sc (Applied Physics)	Kurukshetra university, Kurukshetra	70	First	2009
B.Sc	Kurukshetra university, Kurukshetra	71	First	2005

Research Exposure:

National Post Doc fellow: 5 Aug 2016- 4Aug 2018:
Working with Prof. B.R. Mehta, Department of Physics, Indian Institute of Technology, Delhi, India
Worked on carbon materials based hybrid nanostructures for the applications of photosensor.

Research Associate: 1 Sept 2015 to 4 Aug 2016.
Worked as Research Associate under Prof. B.R. Mehta, Department of Physics, Indian Institute of Technology, Delhi, India.

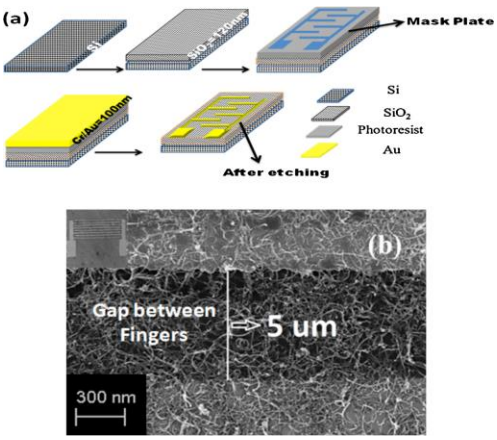
I explored structural and electrical properties of graphene based new hybrid nanostructures with size selective Pd and SnO_2 nanoparticles.

Ph. D: 2011-2015.

"Structural and Electrical Studies of Multiwalled Carbon Nanotubes and their Composites for Gas Sensing Applications". Worked under the supervision of Prof. Neena Jaggi, Department of Physics, National Institute of Technology, Kurukshetra, 136119, Haryana, India.

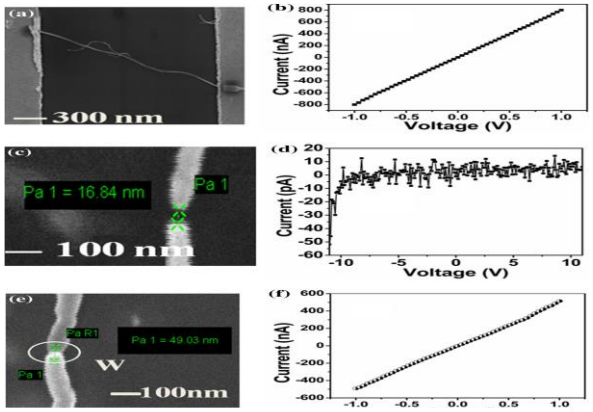
Salient features of research work :

- During PhD work, I explored structural, electrical and gas sensing propertiesof MWCNTs and their hybrid composites. I have identified the process for the successful functionalization of the MWCNTs without altering their tubularstructure and also for separating individual tubes from the bundles. Uniform decoration of MWCNT network by metal oxides/metal nanoparticles usingchemical and physical method. The electrical current of F-MWCNTs network is found to increase to 35 *mA* from 49 *μA* calculated for P-MWCNTs at low sweep voltage. I adopted simple approach for the fabrication of H_2 gas sensor that detect the low concentrations (0.05–1%) of gas with excellent resistance recovery, low recovery time, good repeatability and baseline stability in N_2 atmosphere.



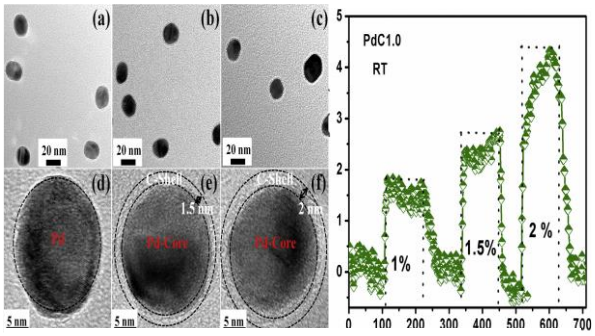
Schematic diagram of fabricated device and (b) SEM image of fabricated interdigitated electrodes

- As CNTs behave like simple resistive wires and Joule heating causes the breakdown of nanotubes. Therefore, we have used EBID technique to join the individual nanotubes spanned on two Au pads. It was demonstrated that, the physical and electrical joining of broken nanotubes is possible with deposition of Pt and W metal using EBID technique. It was investigated that, Pt metal forms ohmic contacts with different shells of MWCNTs after joining as compared to W metal. This interesting approach is important and useful to repair the broken nanotubes incorporated in devices.



(a) Hanging tube between two Au pads. (b) I–V characteristics of the tube shown in (a). (c) Broken tube. (d) I–V characteristic of the be after breakdown. (e) The same tube after W deposition using EBID. (f)

- Also, the effect of carbon shell around size selected palladium (Pd) nanoparticles on hydrogen (H_2) sensing has been studied by investigating the sensing response of Pd-C core-shell nanoparticles having a fixed core size and different shell thickness. The H_2 sensing response of sensors based on Pd and Pd-C nanoparticles deposited on SiO_2 substrate has been measured at room over a temperature. It is observed that Pd-C nanoparticle sensor shows higher sensitivity with increase in shell thickness and faster response/recovery in comparison to that of Pd nanoparticle samples.



HRTEM and Gas sensing response of PdC 0.5 and PdC1.0

Scholarships, awards and fellowships:

- Three year Radha Krishan scholarship during B.Sc from R.K.S.D College, Kaithal Haryana.
- Project fellowship from Centre of Nanoelectronics (CEN), IIT, Bombay.
- Best poster in NCIM conference held in 2014, NIT Kurukshetra.
- Best INUP Project Award in INUP Familiarization Workshop on Nanofabrication Technologies December 16-18, 2015, IITBNF, Bombay.
- NPDF fellowship from SERB, DST from Aug 2016 to Aug 2018.
- CSIR Nehru Post Doc Fellowship 2018.
- DS-Kothari Fellowship 2018.

Professional/employment record:

- 10 months as Lecturer in H.P.I Poly technique Institute, Lohar Majra, kurukshertra.
- 18 month as A.P in K.I.T.M, B.Tech Institute, Bhor Sainda, Kurukshetra.
- 44 Months experience as Post Doc Fellow in Department of Physics, IIT Delhi.

Published papers in Journals:

1. **Shivani Dhall,** Neena Jaggi and Rashi Nathawat, "Functionalized multiwalled carbon nanotubes based Hydrogen gas Sensor", Sensors and Actuators A, **201 (**2013) 321.
2. **Shivani Dhall,** Gayatri Vaidya, Neena Jaggi, "Joining of Broken Multiwalled Carbon Nanotubes using Electron Beam-Induced (EBID) Deposition", J. of Electronic Materials, **43** (2014) 3283.
3. **Shivani Dhall,** Kapil Sood, Neena Jaggi, "A hydrogen gas sensor using Pt sputtered MWCNTs/ZnO nanostructure", Measurement Science and Technology, **25** (2014) 085103.
4. **Shivani Dhall,** Gayatri Vaidya, Neena Jaggi, "Enhancement in electrical properties of Multiwalled carbon nanotubes by decoration with platinum nanoclusters using electron beam induced deposition", Fullerenes, Nanotubes and Carbon Nanostructures, **23** (2014) 371.
5. **Shivani Dhall,** Neena Jaggi, "Hydrogen Sensing of NiO and Cu_2O/Multiwalled Carbon Nanotubes nanostructures at Room Temperature", Sensor Letters, **12** (2014) 1.
6. **Shivani Dhall,** Neena Jaggi, "Improvement in structural and electrical properties of cuprous oxide coated multiwalled carbon nanotubes", Bulletin of material Science, **37** (2014) 1.

7. Neena Jaggi, **Shivani Dhall**, "Hydrogen gas sensing properties of multiwalled carbon nanotubes network partially coated with SnO_2 nanoparticles at room temperature",International J. of Chemical, Nuclear, Metallurgical and Materials Engineering, **8** (2014) 1149.
8. **Shivani Dhall**, Neena Jaggi, "Highly Dispersed Platinum Sputtered Multiwall Carbon Nanotubes Based Hydrogen Gas Sensor at Room Temperature", Sensors and Actuators A, **224** (2015) 50.
9. **Shivani Dhall**, Neena Jaggi, "Room temperature hydrogen gas sensing properties of Pt sputtered F MWCNTs/SnO_2 network", Sensors and Actuators B, **210** (2015) 742**.**
10. **Shivani Dhall,** Neena Jaggi, "Structural studies of functionalized single walled carbon nano-horn", Fullerenes, Nanotubes and Carbon Nanostructures, **23** (2015) 942.
11. **Shivani Dhall,** Kapil Sood, Neena Jaggi, "Effect of highly dispersed sputtered silver nanoparticles on structural properties of multiwalled carbon nanotubes", Materials Science in Semiconductor Processing, **41** (2016) 109.
12. **Shivani Dhall**, Neena Jaggi, "Effect of Oxide Nanoparticles on Structural Properties of Multiwalled Carbon Nanotubes", J of Molecular Structure, **1107** (2016) 300.
13. **Shivani Dhall,** Neena Jaggi, "Hydrogen gas sensing properties of Pt sputtered multiwalled carbon nanotubes composites with oxides", J. of Electronic Materials, **45** (2016) 695.
14. **Shivani Dhall**, "Cost effective synthesis of MWCNTs/PANI composites", Materials Research Express, 3 (2016) 105002.
15. **Shivani Dhall**, Kapil Sood, Rashi Nathawat, "Room temperature hydrogen gas sensors of functionalized carbon nanotubes based hybrid nanostructure: Role of Pt sputtered nanoparticles, International Journal of Hydrogen Energy, 42(2017) 8392.
16. Mehar Bhatnagar, **Shivani Dhall**, Vishakha Kaushik, Akshey Kaushal, Bodh Raj Mehta "Improved selectivity of SnO_2:C alloy nanoparticles towards H_2 and ethanol reducing gases; role of SnO_2:C electronic interaction" Sensors and Actuators B , 246 (2017) 336.
17. Vinod Singh, **Shivani Dhall,** Akshey Kaushal, Bodh Raj Mehta, "Room Temperature Response and Enhanced Hydrogen Sensing in Size Selected Pd-C Core-Shell Nanoparticles: Role of Carbon Shell and Pd-C Interface", International Journal of Hydrogen Energy, 43(2018) 1025.

18. **Shivani Dhall,** Mansavi Kumar, Mehar Bhatnagar, Bodh Raj Mehta, "Dual Gas Sensing Properties of Graphene-Pd/SnO_2 composites for H_2 and Ethanol: Role of Nanoparticles-Graphene interface" International Journal of Hydrogen Energy 43 (2018) 17921.

Research Publication in International/National Conferences:

1. **Shivani Dhall,** B. R. Mehta, Effect of acid stimulation on the photoresponse of single walled carbon nanotubes, DAE, BARC, Bomaby, (26-30 Dec. 2017).

2. **Shivani Dhall,** B. R. Mehta, Photo-response of carbon nanotubes and Si junctions, IWPSD, IIT Delhi, (11-15 Dec 2017).

3. **Shivani Dhall,** B. R. Mehta, Room Temperature Photo Sensor Based on Carbon Nanotubes/Silicon Interface, MRS fall spring, Boston, (26 Nov.-1 Dec, 2017).

4. **Shivani Dhall**, B. R. Mehta, Fabrication of ZnO based NO gas sensor, Nano India 2017, IIT Delhi (15-16 March, 2017).

5. **Shivani Dhall**, Mansavi Kumar, B.R. Mehta, Graphene-Pd/SnO_2 composites for the application of gas sensor: Role of Graphene- nanoparticles interfaces, IUMRS - ICYRAM2016, Materials Research Centre, Indian Institute of Science, Bangalore (11-15 Dec).

6. **Shivani Dhall**, Multiwalled carbon nanotubes based hydrogen gas sensor, World Congress on Microscopy: Instrumentation Techniques and Applications in Life Sciences and Material Sciences, Kottayam, Kerala, India, (9-11 Oct, 2015).

7. Neena Jaggi, **Shivani Dhall**, Hydrogen Gas Sensing Properties of Multiwalled Carbon Nanotubes Network Partially Coated with SnO_2 Nanoparticles at Room Temperature,8 (2014), ,Int. J. of Chemical, Molecular, Nuclear, Materials and Metallurgical Engineering, WASET, Australia (Dec. 11-12, 2014).

8. **Shivani Dhall**, Deepa Bhargava, Neena Jaggi, "Dispersion of Multiwalled carbon Nanotubes in Different Solvents 39 (2014), National Institute of Technology, Kurukshetra (March 09-10, 2014).

9. **Shivani Dhall,** Neena Jaggi, Effect of Top Metal Contact on the Electrical Properties of Suspended Spiral Multiwalled Carbon Nanotube, 1591 (2014), DAE conferene, Thapar University, Patiala (Dec 17-22, 2013).

10. Neena Jaggi, **Shivani**, Lavneesh Jaggi, Fabrication of Nanocomposites of Nickel Oxide with Multiwalled Carbon Nanotubes for Hydrogen Sensing, 8, 4 (2013), International Journal of Computer Applications, Manipal Institute of Technology, Manipal (Dec 10-14, 2012).

11. **Shivani** and Neena Jaggi, Electrical enhancement in Pd attached Multiwalled Carbon Nanoatubes, International Conference on Emerging Technologies - Micro to Nano; ETMN, 233 (2013), BITS, Pilani (23-24 Feb. 2013).

12. Neena Jaggi and **Shivani**, Attachment of Multiwalled Carbon Nanotubes with Cuprous Oxide Nanoparticles, 178 (2012), AECT-2012, Manipal Institute of Technology, Manipal (Feb 2-5, 2012).

13. **Shivani** and Neena Jaggi, Thin Films of Multiwalled Carbon Nanotubes in Poly Vinyl Alcohol Matrix, 75 (2012), NCRAMS-2012, Dyal Singh College, Karnal, Haryana (Feb. 25-26, 2012).

14. **Shivani** and Neena Jaggi, Raman Spectra of Multiwalled Carbon Nanotubes: An overview, 179 (2012), NCRAMS-2012, Dyal Singh College, Karnal, Haryana (Feb. 25-26, 2012).

15. **Shivani** and Neena Jaggi, Fabrication of Nanocomposites of Nickel oxide with Multiwalled carbon nanotubes, 134 (2012) 9th Nanomechanical sensing workshop, NMC 2012, IIT Bombay, Mumbai (6th-7th June 2012).

16. Kanta, **Shivani** and Neena Jaggi, Synthesis and Characterization of ZnO Nanopaticles by Wet Chemical Route, 140 (2012) NCRAMS-2012, Dyal Singh College, Karnal, Haryana (Feb. 25-26, 2012).

Book Chapter:

- **S. Dhall**, K. Sood, R. Priya, Chemical Functionalization of Carbon Nanomaterials : Chemistry and applications, Chapter entitled "Chemical Functionalization of Carbon Nanomaterials: Processing and Applications", Taylor and Francis, CRC Press, ISBN: 9781482253948 (2015).

- **S. Dhall**, B. R. Mehta, The Physics of Semiconductor Devices, Chapter entitled "Photo-Response of Carbon Nanotubes and Si Junctions", Springer Nature Switzerland AG, ISBN: 9783319976037 (2018) 153.

Research experience: 7 years

Other information:

- I have completed my experimental research work on the project of "Fabrication of Thin Films of Composites of Multiwalled carbon Nanotubes for their applications in sensors" at Indian Nanoelectronic User Programme (INUP) under Centre of Excellence (CEN), Electrical department, IIT Bombay.

- Reviewer of Journals: Sensors and Actuators A
  - Materials Science in Semiconductor Processing
  - Physica E
  - Vaccum
  - Zeitschrift für Naturforschung A (A Journal of Physical Sciences)
  - International Journal of Hydrogen Energy

- Invited talk in World Congress on Microscopy: Instrumentation Techniques and Applications in Life Sciences and Material Sciences, Kottayam, Kerala, India, 9-11 October, 2015.
- Guest editor of Elsevier: Materials Today Proceedings in the conference of Hybrid and Composite Materials, Chemical Processing (Oct 25 – 27) 2016, Hyderabad, India.
- Co-PI of M.Sc. thesis Bhai Gurudas Degree Collage, 2017.
- Invited talk in ICSEM 2018 (6-8 Jan), Sharda University, Greater Noida, India.

Membership:

- Member of Materials Research Society.
- Member of Indian Association for Hydrogen Energy and Advanced Materials, India

Key Skills:

- Expertise in experimental methods related to Covalent and Non covalent functionalization of CNTs, synthesis of CNTs composites by chemical co-precipitation and sputtering route.

- Knowledge of XRD, Raman, SEM, TEM, FTIR, Photolithography, EBID technique, electrical conductivity and gas sensing measurements related to carbon materials and composites.

- Expertise in handling analytical instruments like XRD, thermal evaporator, optical microscope and UV-Visible.

- Computational: Windows, Origin, FULLPROF, X'Pert PRO. Klevin and Image J.

Personal Information:

Dath of Birth : 24th January, 1985
Marital status : Married
Sex : Female
Religion : Hindu
Nationality : Indian
Language known: Hindi, English, Punjabi.
Hobbies : Research, Music and chatting, TV watching

Correspondence address

Dr. Shivani Dhall
Assistant Professor,
DAV Collage, Jalandhar
Punjab,144008. India
Mob: 8851164015.

Permanent address:

Dr. Shivani Dhall,
D/O Sh. Ramesh Chand Dhall,
Nand Colony No-2, Ward No-5,
Gali No-6, Kaithal Road, Pehowa,
Dist-Kurukshetra, Haryana, India
136128.

References:

- **Dr. B. R. Mehta**, Department of Physics, Indian Institute of Technology, Delhi, Email: brmehta@physics.iitd.ac.in, mob: 9891076842.

- **Dr. A.K.Tyagi,** Visiting Professor, Department of Physics, IIT Delhi, Former Head, Surface and Nanoscience Division at Materials Science, IGCAR, Kalpakkam. Email: akt@igcar.gov.in, mob: 9894184808.

- **Dr. A. G. Murugkar**, Department of Physics, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Email: agmurugkar@gmail.com, mob: 9422211261.

- **Dr. Neena Jaggi,** Department of Physics, National Institute of Technology, Kurukshetra, Email:neena_jaggi@rediffmail.com, mob: 9896197827.

Declaration:

I am confident of taking any assignment with full enthusiasm and loyalty to work. I declare that details furnished above are true to the best of my knowledge and belief. I can join within one month after the confirmation letter of selection.

SHIVANI DHALL