Resume of Dr. Hemen Kakati

Full Name : Dr. Hemen Kakati

Date of Birth : 01-03-1981

Marital Status : Married

Address for Correspondence:

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Academic Qualifications:

Bachelor of Science (B.Sc.), 2001, Physics Major, Mathematics, Statistics, Gauhati University, 71.11 %, 1st Class, 3rd rank in university

Master of Science (M.Sc.), 2003, Physics, Gauhati University, 71.2 %, 1st Class, 5th rank in University

Doctor of Philosophy (Ph. D.), 2009, Gauhati University,

Thesis Title: ***Discharge and Deposition Characteristics of RF magnetron Plasma***

Thesis Summary:

Electrical characterization of rf magnetron plasma under different system conditions have been studied. Radial and axial behaviour of plasma potential as well other plasma parameters including the sheath characteristics have been investigated in rf magnetron plasma using Langmuir and Emissive probe technique. Using Mach probe the electron's EXB drift velocity have been investigated at different conditions and positions in the rf magnetron plasma.

Using Optical emission spectroscopy different modes of reactive magnetron discharge have been optimized for suitable deposition of aluminium oxide thin film. In the poisoned mode of sputtering, nanostructured crystalline alumina thin films have been deposited by rf magnetron sputtering plasma without any substrate heating. Under different conditions aluminium oxide thin film are deposited and are characterized by AFM, SEM, EDX, XRD techniques. Corrosion and adhesion tests have been done for using aluminium oxide thin film as a protective and decorative coating on bell metal.

Present Position: Assistant Professor, Nalbari College, Assam, India.

Professional Experience:

- **Plasma Diagnostics:**

  Single & double Langmuir probe, Planar Probe, Mach Probe, Emissive Probe, Optical emission spectroscopy, RF compensating probe

- **Plasma Sources and their applications:**

  Radio frequency planar magnetron discharge, DC post magnetron discharge, RF capacitively coupled plasma, double plasma device, Double magnetron sputtering plasma, metal oxide deposition by RF magnetron sputtering, metal nitride deposition by dc magnetron sputtering, multilayer coating, Plasma polymerization of styrene and HMDSO by RF capacitively coupled plasma.

- **Characterization of surface/film properties:**

  X-ray diffractometry (XRD), Scanning electron microscopy (SEM), Energy-dispersive X-ray analysis (EDX), Atomic force microscopy (AFM), UV-VIS absorption spectroscopy, Fourier Transform Infrared Spectroscopy, corrosion test, adhesion test.

- **Important computer programming/software:**

  Lab view, Fortran, Matlab, Origin 6.0

- **Lithography:**

  UV, e-beam and focused ion beam lithography.

Brief description of work done:

- Plasma properties like – sheath structure, drift velocity, ion density - electron temperature variation, electrical characteristics in rf magnetron argon plasma.

- Study of reactive (argon + oxygen) plasma properties – sheath structure, density-temperature variation, emission spectroscopy measurement of aluminium and aluminium oxide.

- Synthesis and characterization of aluminium oxide and titanium oxide deposition on bell metal by rf magnetron sputtering plasma.

- RF capacitively coupled plasma polymerization for monomer like Styrene, HMDSO.

- Gradient Multilayer thin film deposition by double magnetron sputtering plasma.

- Cytotoxic effect of nanoparticles and antibacterial properties of TiO films

Research Experiences:

- Worked as Junior Research Fellow in a project "Study of Metal Oxide Deposition by RF Magnetron Plasma" sponsored by DAE-BRNS in Institute of Advanced Study in Science and Technology.

- Worked as Junior and Senior Research Fellow in a project "Study of Post Magnetron Discharge Plasma" sponsored by DST-Govt. of India in Institute of Advanced Study in Science and Technology.

- Worked as a CSIR Senior Research Fellow at the Institute of Advanced Study in Science and Technology.

- Worked as a Post Doctoral Fellow and Institute for Plasma Research, Gandhinagar.

Teaching Experiences:

Part time Physics Lecturer; Arya Vidyapeeth College, Guwahati (01st October, 2004 – 31st December, 2004)

Post Graduate teacher; Kendriya Vidyalaya, Guwahati (08th January, 2005 – 22nd February, 2005)

Assistant Professor; Jorhat Institute of Science and Technology, Jorhat (17th August, 2010 to 02-11-2015)

Assistant Professor; Nalbari College, Nalbari (03rd November, 2015 to till date)

Award Received:

a) Senior Research Fellowship from Council of Industrial and Scientific Research, India in 2008.

b) Post Doctoral Fellowship from Institute for Plasma Research in 2010,

Publications

Journals:

1. **"*Sheath and potential characteristics in rf magnetron sputtering plasma*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia,
   J. Appl. Phys. **100**, 083303 (2006), AIP.

2. **"*Effect of oxygen on the characteristics of radio frequency (rf) planar magnetron sputtering plasma used for aluminium oxide deposition"***
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   J. Appl. Phys. **101**, 083304 (2007), AIP.

3. **"*Investigation of the E×B rotation of electrons and related plasma characteristics in a radio frequency magnetron sputtering discharge"***
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   J. Phys. D: Appl. Phys. **40**, 6865 (2007), IOP.

4. **"*Deposition of nanostructured crystalline and corrosion resistant alumina film on bell metal at low temperature by rf magnetron sputtering*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   Appl. Surf. Sc. **255**, 7403 (2009), ELSVIER.

5. **"*The influence of RF power and gas pressure on the surface characteristics of aluminium oxide deposited by rf magnetron sputtering*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   J. Phys. Conf. Series **208**, 012102 (2010), IOP.

6. **"*Synthesis and characterization of plasma polymerized styrene films by RF discharge*"**
   A. J. Choudhary, H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   J. Phys. Conf. Series **208** 012104 (2010), IOP.

7. **"*Studies of radiofrequency plasma deposition of hexamethyldisiloxane films and their thermal stability and corrosion resistance behaviour*"**
   A. J. Choudhury, Joyanti Chutia, H. Kakati, S. A. Barve, A. R. Pal, N. S. Sarma, D. Chowdhury and D. S. Patil
   Vacuum, **84,** 1327 (2010), ELSVIER.

8. *"**Studies of physical and chemical properties of styrene-based plasma polymer films deposited by radiofrequency Ar/styrene glow discharge"***
   A.J. Choudhury, Joyanti Chutiaa, S.A. Barve, H. Kakati, A.R. Pal, Jagannath, N. Mithal, R. Kishore, M. Pandey, D.S. Patil
   Progress in Organic Coatings, **70,** 75 (2011), ELSVIER.

9. "***Effect of impinging ion energy on the substrates during deposition of SiOx films by radiofrequency plasma enhanced chemical vapor deposition process"***
   Arup J Choudhury, Shruti A Barve, Joyanti Chutia, Hemen Kakati, Arup R Pal, Jagannath N Mithal, R Kishore, M Pandey, Dinkar S Patil
   Thin Solid Films, **519,** 7864 (2011), ELSVIER

10. "***Cytotoxic effect of silver-nanoparticle on root meristem on Allium Sativum L."***
    Bhaben Tanti, Ajoy Kumar Das, Hemen Kakati and Devasish Chowdhury
    Journal of Research in Nanobiotechnology, **1,** 1(2012), FICUS

Conferences:

1. **"*Study of Metal Oxide Deposition on Bell Metal by RF Magnetron Sputtering*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   Proceedings of the *National Symposium on Plasma Science and Technology*
   Cochin University, Kochi, India (2005).

2. **"*Estimation of E×B drift velocity of electrons in a rf planar magnetron sputtering system*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   Proceedings of the *National Symposium on Plasma Science and Technology*
   MNIT, Jaipur, India (2006).

3. **"*Emissive probe study of the potential structure inside the sheath in RF magnetron plasma"***
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   5th Conference of Physics Academy of the North East
   Gauhati University, Guwahati, India (2007).

4. **"*Investigation of the properties of Ar/O_2 radio frequency magnetron sputtering plasma"***
   A. R. Pal, H. Kakati, H. Bailung and Joyanti Chutia
   5th Conference of Physics Academy of the North East
   Gauhati University, Guwahati, India (2007).

5. **"*Study of discharge characteristics on transistion from metallic to reactive mode in radio frequency mangnetron plasma"***
   Joyanti Chutia, H. Kakati, A. R. Pal and H. Bailung
   Gaseous Electronics Conference, Virginia, October 2-5 (2007).

6. **"*The influence of oxygen flow rate on deposition characteristics of aluminium oxide thin film in a rf magnetron plasma*"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   Proceedings of the *National Symposium on Plasma Science and Technology*
   Institute for Plasma Research, Ahmedabad, India (2007).

7. **"The influence of RF power and gas pressure on the surface characteristics of aluminium oxide deposited by rf magnetron sputtering"**
   H. Kakati, A. R. Pal, H. Bailung and Joyanti Chutia
   Proceedings of the *National Symposium on Plasma Science and Technology*
   BARC, Mumbai, India (2008).

8. **"Synthesis and characterization of plasma polymerized styrene films by RF discharge"**
   A. J. Choudhary, H. Kakati, A. R. Pal and Joyanti Chutia
   Proceedings of the *National Symposium on Plasma Science and Technology*
   BARC, Mumbai, India (2008).

9. **"Nanostructured crystalline alumina thin film as a protective coating deposited by rf magnetron sputtering plasma"**
   Hemen Kakati
   Winter School on Physics and Chemistry of Materials
   JNCASR, Bangalore, India (2009).

10. **"*Optical emission spectroscopic study of rf magnetron sputtering plasma for titanium oxide film deposition*"**
    H. Kakati, S. M. Borah, A. R. Pal, H. Bailung and Joyanti Chutia
    Proceedings of the *National symposium on Plasma Science and Technology*
    NIT, Himachal Pradesh, India (2009).

11. **"*The effect of reactive plasma treatment on dyeing and tensile properties of muga fibres*"**
    H. Kakati, A. J. Choudhary, A. R. Pal, and Joyanti Chutia
    Proceedings of the *National symposium on Plasma Science and Technology*
    NIT, Himachal Pradesh, India (2009).

12. **"*GIS as a tool for studying spatio temporal variation of air pollution*"**
    H Kakati
    National Seminar on "Envirnomental Awareness: Issues, Concerns and Challenges"
    Nalbari College (2016)

13. **"*Resemblance between Quantum Physics and Vedanta"***
    Hemen Kakati
    National Seminar on "Vedas: the Storehouse of knowledge
    Nalbari College, Nalbari (2017)

14. **"*Aluminium Oxide functionanal gradient coating for improved adherence to material protection by magnetron sputtering*"**
    Hemen Kakati
    National Seminar on Advances in Material Science
    GU, guwahati (2017)

15. **"*Magnetron sputtered functional gradient coating as impediment to crack Propagation*"**
    Hemen Kakati
    XIII Biennial National Conference of PANE (2022).

Workshops, conferences attended:

1. **"*PSSI National Workshop-2005*"**
   BIT, Jaipur, India in year 2005.

2. **"*National Symposium on Plasma Science and Technology-2005*"**
   Cochin Univeristy, India in 2005.

3. **"*Workshop on Nanotechonology-2005*"**
   Gauhati University, India in 2005.

4. **"*PSSI-IPR workshop on National Fusion Program-ITER and Beyond*"**
   IPR, Ahmedabad, India in 2006.

5. **"*National Symposium on Plasma Science and Technology-2006*"**
   MNIT, Jaipur, India in 2006.

6. **"*5th Conference of Physics Academy of the North East*"**
   Gauhati University, Guwahati, India in 2007.

7. **"*National Symposium on Plasma Science and Technology-2007*"**
   IPR, Ahmedabad in 2007.

8. **"*Development and optimization of combined plant/microbe technologies for bioremediation of soils contaminated with hydrocarbons and heavy metals"***
   Jointly organized by University of Sydney, Australia and IASST, Guwahati in 2008.

9. **"*Workshop on Recent Trends in Polymer Science"***
   IASST, Guwahati in 2008.

10. "*National Symposium on Plasma Science and Technology-2008*"
BARC, Mumbai, India in December 2008.

11. "*Workshop on Introduction to Matlab and Labview*",
Physics Department, Gauhati University in December 2008.

12. "*4th Advanced School on Nanoscience and Technology*"
S. N. Bose National Centre for Basic Sciences, Kolkata in January 2009.

13. "*Winter School on Physics and Chemistry of Materials"*
JNCASR, Bangalore in November – December 2009.

14. "*National Symposium on Plasma Science and Technology-2009*"
NIT, Himachal Pradesh, India in December 2010.

15. "*Orientation Programme on Semester Course in Under Graduate Level – 2011*"
CKB Commerce College, Jorhat, Assam in February 2011.

16. ***"National Workshop on Recent Trends in Nanoscience and Technology – 2011"***
Bahona College, Jorhat, India in May 2011.

17. ***"Training Cum Workshop in Electronics And Computer Laboratory Applications For College Teachers (Physics) – 2011"***
Cotton College, Guwahati, India in June 2011.

18. ***"International Symposium on Frontier Areas (ISOFA-II)"***
CSIR-NEIST, Jorhat, India in September 2011.

19. **"*Mission 10X Workshop on High Impact Teaching Skills"***
Wipro, JEC, Jorhat, India in October 2011.

20. "**Geographical Information Systems"**
Govt. of India, Assam Administrative Staff College, Guwhati in November, 2011

21. "**INUP Familiarization Workshop**" Specially for NE
IIT Guwahati, September, 2012

22. National Workshop on "***Atomistic simulation techniques for Material Science, Nano Technology and Biosciences (NWAST-2015)"*** IIT, Guwahati 2015

23. National Seminar on "***Envirnomental Awareness: Issues, Concerns and Challenges***"
Nalbari College, Nalbari 2016

24. Workshop on "***Implementation of CBCS at under graduate level: opportunities and Challenges***" Nalbari College 2016

25. Workshop on "***Issues in the Introduction of CBCS at the UG level in Colleges of Assam"***
MNC Balika Mahavidyalaya ,2017

26. National Seminar on ***Advances in Material Science*** , GU, 2017

27. National Seminar on "***Vedas: the Storehouse of knowledge***" Nalbari College, 2017

28. International Seminar on "***Covid-19 and Act East Policy…***", Centre for South East Asian Studies KBVS&ASUniversity 2020.

29. Webinar "***The Fourth State of Matter….***", BBK College 2020.

Orientation Course/ Refresher Course/ attended:

1. Orientation Programme, 09/10/2017 to 03/11/2017, JNU HRDC.

2. FDP "Behavioral Remodelling…" 26/11/2018 – 02/12/2018, E&ICT, IITG.

3. Refresher Course "Disaster Management", 19/08/2019 - 01/09/2019, HRDC – GU.

4. FDP "E-contents and ICT tools for innovative and effective teaching", 06/07/2020 – 12/07/2020, Nandalal Borgohain City College in collaboration with BSVS educational center, Nagpur, India.

5. FDP "Scilab", 19-08-2020 to 25-08-2020, Rangia College.

6. FDP "Research Methodology and Classroom Management Skills", 20/12/2021-26/12/2021, E&ICT, IITG in association with Nalbari College.

7. Interdisciplinary Refresher Course "Research Methodology", 20-11-2021 to 05-10-2021, Teaching Learning Center, Ramanujan College, University of Delhi.