CURRICULUM VITAE

Dr. Jayanta Kr. Bal

Assistant Professor

Department of Physics,
Abhedananda Mahavidyalaya,
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PERSONAL DETAILS

Father's Name	Mr. Jyotirmoy Bal
Date of Birth	28.04.1982
Sex	Male
Nationality	Indian
Residential Address	Rabindra Pally, 10 No. ward, Sainthia, Dist. – Birbhum, West Bengal – 731234, India

EDUCATION

Assistant Professor — **2017-Present**

Department of Physics, Abhedananda Mahavidyalaya,
University of Burdwan, Govt. of WB

DST INSPIRE Faculty — **2014-2017**

CRNN, University of Calcutta, Kolkata, India

Post doctoral fellow — **2012-2014**

University of Maine, Le Mans, France.

Post doctoral fellow 2010-2012

Indian Association for the Cultivation of Science, Kolkata, WB

DST project "*Centre for Nano Technology for Photovoltaics and Sensor devices".*

Ph. D. in Physics 15th July 2011

Saha Institute of Nuclear Physics, Kolkata, WB.

Thesis title: *"Interfacial Instability Driven Growth of Low Dimensional Structures".*

Post M.Sc. in Physics 2005 Class-I

Saha Institute of Nuclear Physics, Kolkata, WB.

Dissertation: "Morphology and transport properties of Low Dimensional Structures" [Scanning tunneling microscopy (STM) based].

M.Sc. in Physics 2004 Class-I

Visva-Bharati, Santiniketan, WB.

Specialization: Atomic and molecular physics.

ACHIEVMENTS

- Qualified in Joint Entrance Screening Test (JEST), Govt. of India, 2004. **Rank - 141**
- Research Scholarship, Saha Institute of Nuclear Physics, India, 2004. **Awarded in 2004**
- Qualified in National Eligibility Test (NET), Govt. of India, 2009. **Rank – 47 (LS)**
- "INSPIRE Faculty" award, DST, Govt. of India, 2013. **Awarded in December 2013**
- "Assistant Professor" position, WBCSC, 2015. **Offered on 2015 (Rank 80)**
- "Assistant Professor" position, WBCSC, 2017. **Offered on 2017 (Rank 36)**

RESEARCH INTERESTS

- Growth of nanolayers (noble metal films and Langmuir-Blodgett film of amphiphilic molecules) on semiconductor surfaces.
- Wet-chemical surface passivation of different semiconducting surfaces.
- Scanning tunneling spectroscopy (STS) study of different shaped colloidal nanoparticles of different materials which have large applicability in photovoltaics and memory storage devices.
- Swelling of polymer ultrathin films under supercritical carbon dioxide (sc-CO_2).
- Wetting & dewetting of polymer ultrathin films.

- X-ray scattering (e.g. GISAXS, SAXS, XRR, XRD) using lab source and synchrotron source.
- Properties of Bio-molecules monolayer and multilayer at air-water interface.

EXPERIENCE

- Characterization and study of different materials (hard and soft materials) by various techniques such as XRR, SAXS, GISAXS, resonant soft X-ray (using synchrotron in ESRF, SOLEIL, Elettra, LBNL and lab source), XRD, AFM (ambient and UHV), STM (UHV), SEM, Ellipsometry.
- STS study of colloidal Nanocrystals and heterojunctions.
- Preparation of metal and soft ultrathin films using magnetron sputtering and Langmuir-Blodgett techniques respectively. Preparation of different polymer ultrathin films using spin-coating and dip-coating techniques.
- Wet chemical passivations of semiconductor surfaces (extensively).Contact angle measurement.
- 7 yrs experience (from the installation) in handling and maintenance of UHV equipment.

POSITION HOLD

JRF	**2004-2006**
SRF	**2006-2010**
SRF-extended	**2010-2011**
Research Associate	**2011-2012**
Post Doctoral Fellow	**2012-2014**
DST-INSPIRE Faculty	**2014-2017**
Assistant Professor	**2017-Present**

PUBLICATION

In Journals:

1. Interfacial role in room-temperature diffusion of Au into Si substrates,
   J. K. Bal and S. Hazra, *Phys. Rev. B*, 75, 205411 (2007).

2. Atmospheric pressure induced atomic diffusion into solid crystal,
   J. K. Bal and S. Hazra, *Phys. Rev. B*, 79, 155405 (2009).
   [Highlighted in Virtual Journal of Nanoscale Science & Technology, vol. 19 issue 15 (2009)]

3. Time-evolution growth of Ag nanolayers on differently passivated Si(001) surfaces,
   J. K. Bal and S. Hazra, *Phys. Rev. B*, 79, 155412 (2009).

4. Growth and stability of Langmuir-Blodgett films on OH-, H-, or Br-terminated Si(001),
   J. K. Bal, S. Kundu and S. Hazra, *Phys. Rev. B*, 81, 045404 (2010).
   [One image is highlighted in PRB Kaleidoscope (2010), also highlighted in Vertical News of Science (Physics)]
   [**http://www.verticalnews.com/premium_newsletters/News-of-Science/2010-03-07/63130NOS.html**].

5. Evolution of interdiffused Gaussian-shape nanolayer in Au-Si(111) system at ambient condition,
J. K. Bal and S. Hazra, *Defect Diffus. Forum*, 297-301, 1133-1139 (2010).

6. Correlation between local structure and refractive index of e-beam evaporated (HfO_2-SiO_2) composite thin films,
N. C. Das, N. K. Sahoo, D. Bhattacharyya, S. Thakur, N. M. Kamble, D. Nanda, S. Hazra, **J. K. Bal**, J. F. Lee, Y. L. Tai and C. A. Hsieh, *J. Appl.Phys*. 108, 023515 (2010).

7. Hydrophobic to hydrophilic transition of HF-treated Si surface during Langmuir-Blodgett film deposition,
J. K. Bal, S. Kundu and S. Hazra, *Chem. Phys. Lett.* 500, 90 (2010).
[Highlighted in Vertical News of Chemical Physics]
http://www.verticalnews.com/premium_newsletters/Physics-Week/2011-02-01/64428PH.html]

8. Size Selective Excitonic Transition Energies in Strongly Confined CdSe Quantum Dots,
U. Thupakula, A. H. Khan, **J. K. Bal**, K. Ariga and S. Acharya, *J. Nanoscience and Nanotechnology* 71, 7709 (2011).

9. Reorganization of Au nanoparticle Langmuir-Blodgett Films on wet chemically passivated Si (001) surfaces,
S. Kundu and **J. K. Bal**, *J. Appl. Phys*. 110, 114302 (2011).

10. Modifications of local structures of Gd2O3 on incorporation of SiO2,
N. C. Das, N. K. Sahoo, D. Bhattacharyya, S. Thakur, D. Nanda, S. Hazra, **J. K. Bal**, J. F. Lee, Y. L. Tai and C. A. Hsieh, *J. Appl. Phys*. 110, 063527 (2011).

11. Role of metal ions of Langmuir-Blodgett film in hydrophobic to hydrophilic transition of HF-treated Si surface
J. K. Bal, S. Kundu and S. Hazra, *Mater. Chem. Phys.* 134, 549 (2012).

12. Role of metal ions and passivating elements on structure and stability of Langmuir-Blodgett films,
J. K. Bal, S. Kundu and S. Hazra, *Eur. Phys. J. E* 35, 79 (2012).

13. Short-lived, Intense, Narrow Bluish-green Emitting Gold Zinc Sulfide Semiconducting Nanocrystals
R. Bose,U. Thupakula, **J. K. Bal** and N. Pradhan, *J.Phys. Chem.C* 116, 16680 (2012).

14. Hydrophilic-like wettability of Cl-passivated Ge(001) surface,
J. K. Bal, S. Kundu and S. Hazra, *Chem. Phys.* 406, 72 (2012).

15. Ultra Narrow PbS Nanorod Field Emitter,
U. Thupakula, **J. K. Bal**, A. Debangshi, A. H. Khan, A. Dalui and S. Acharya, *J.Phys. Chem.C* 116, 18564 (2012).

16. Surface correlation behaviors of metal-organic Langmuir-Blodgett films on differently passivated Si(001) Surfaces,
J. K. Bal and S. Kundu *J. Appl. Phys*. 113, 114905 (2013).

17. Current rectification by a single ZnS nanorod probed using a scanning tunneling microscopic technique,
U. Thupakula, **J. K. Bal,** A. Dalui, A. Debangshi, D. D. Sarma and S. Acharya, *J. Mat. Chem.* C 2, 1158 (2014)

18. Concentration Mediated Structural Transition of Tri-block Copolymer Ultrathin Films
J. K. Bal, M. Mukherjee, N. Delorme, M. K. Sanyal and A. Gibaud, *Langmuir* 30, 5808 (2014).

19. Shape Dependent Synthesis and Field Emission Induced Rectification in Single ZnS Nanocrystals
U. Thupakula, A. Dalui, A. Debangshi, **J. K. Bal,** G. S. kumar and S. Acharya, *ACS applied materials & interfaces* 6, 7856 (2014).

20. Densification and Depression in Glass Transition Temperature in Polystyrene Thin Films
G. Vignaud, M. S. Chebil, **J. K. Bal**, N. Delorme, T. Beuvier, Y. Grohens, and A. Gibaud, *Langmuir* 30, 11599 (2014).

21. Relaxation of Ultrathin Polystyrene Films Hyperswollen in Supercritical Carbon Dioxide
J. K. Bal, T. Beuvier, M. S. Chebil, G. Vignaud, Y. Grohens, M. K. Sanyal, and A. Gibaud, *Macromolecules* 47, 8738 (2014).

22. Molecular Packing of Metal-Organic Langmuir-Blodgett Films on Differently Passivated Si (001) Surfaces
J. K. Bal and S. Kundu *J. Nanoscience and Nanotechnology* 15, 5285 (2015).

23. Stability of Polymer Ultrathin Films (<7 nm) Made by a Top-Down Approach
J. K. Bal, T. Beuvier, A. B. Unni, E. A. C. Panduro, G. Vignaud, N. Delorme, M. S. Chebil, Y. Grohens and A. Gibaud, *ACS Nano* 9, 8184 (2015).

24. Solvent Assisted Rinsing: Stability/Instability of Polymer Ultrathin Films
A. Beena Unni, G. Vignaud, **J. K. Bal**, N. Delorme, T. Beuvier, S. Thomas, Y. Grohens and A. Gibaud, *Macromolecules* 49, 1807 (2016).

25. Swelling of poly(n-butyl methacrylate) Films Exposed to Supercritical Carbon Dioxide: A Comparative Study with Polystyrene
J. K. Bal, T. Beuvier, G. Vignaud, M. S. Chebil, S. B. Jabrallah, I. Ahmed, Y. Grohens and A. Gibaud, *Langmuir* 32, 1716 (2016).

26. Resonant Soft X-ray Reflectivity of Ultrathin Polymer films at the C-edge: A Direct Approach
A. Gibaud, **J. K. Bal**, E. M. Gullikson, C. Wang and G. Vignaud, *AIP Advances* 6, 095016 (2016).

27. Nanostructured ZnO gas sensors obtained by green method and combustion technique
S. Goutham, S. Kaur, K. K. Sadasivuni, **J. K. Bal**, N. Jayarambabu, D. S. Kumar and K. V. Rao, *Materials Science in Semiconductor Processing* 57, 110 (2017).

28. Probing the Density Variation of Confined Polymer Thin Films via Simple Model-Independent Nanoparticle Adsorption
A. Beena Unni, G. Vignaud, J. P. Chapel, J. Giermanska, **J. K. Bal**, N. Delorme, T. Beuvier, S. Thomas, Y. Grohens, and A. Gibaud, *Macromolecules* 50, 1027 (2017).

29. Reversibility in glass transition behavior after erasing stress induced by spin coating process
M. S. Chebil, G. Vignaud, **J. K. Bal**, N. Delorme, T. Beuvier, A. B. Unni, Y. Grohens and A. Gibaud *Polymer* 122, 45-51 (2017).

30. Conformation Mediated Selective Swelling Dynamics of Amphiphilic Block Copolymer Ultrathin Films
J. K. Bal, M. Mukherjee, L. Dildar and A. Gibaud, *J. Pol. Research* 24, 222 (2017).

31. Chitosan-fatty acid interaction mediated growth of Langmuir monolayer and Langmuir-Blodgett films
I. Ahmed, L. Dildar, A. Haque, P. Patra, M. Mukhopadhyay, M. Kulkarni, S. Thomas, J. R. Plaisier, S. B. Dutta, S. Hazra and **J. K. Bal**, *J. Colloid Interf. Sci.* 514, 433 (2018).

32. Vitamin C/Stearic Acid Hybrid Monolayer Adsorption at Air−Water and Air−Solid Interfaces
I. Ahmed, A. Haque, S. Bhattacharyya, P. Patra, J. R. Plaisier, F. Perissinotto, and **J. K. Bal** *ACS Omega* 3, 15789 (2018).

In proceeding:

1. Interfacial role in room-temperature diffusion of Au into Si substrates,
   J. K. Bal and S. Hazra, proceedings of the DAE Solid State Physics Symposium, Bhopal, 2006.

2. Dewetting study of Ag film on Si(001) substrates at ambient condition,
   J. K. Bal and S. Hazra, proceedings of the DAE Solid State Physics Symposium, Mumbai, 2008.

I am an editor of a book entitled "**NANOSPECTRUM: A Current Scenario**" ALLIED PUBLISHERS PRIVATE LIMITED, New Delhi, India, 2016.

SEMINARS & WORKSHOPS

- Imaging and spectroscopic study by scanning tunneling microscope (STM). [Talk]
  SERC school, SINP, Kolkata, 2006.
- Interfacial role in room-temperature diffusion of Au into Si(001) and Si(111) substrates. [Poster] DAE SSPS 2006, Barkhatullah University, Bhopal.
- Discussion Meeting on "Role of Surface & Interfaces in Nanomaterials", SINP, Kolkata, 2007.
- India-Japan workshop on Quantum Beam Science, SINP, Kolkata, 2008.
- Growth and evolution of Langmuir-Blodgett films on chemically engineered surfaces. [Poster]
  MRSI-AGM, SINP, Kolkata, 2009.
- Room temperature wave-like diffusion of Au into Si substrates. [Poster] DSL, Rome, Italy, 2009.
- Time evolution growth of Ag nanolayers on differently passivated Si(001). [Poster]
  Nanotoday, Biopolis (Matrix), Singapore, 2009.
- JSPS-DST Asian Academic Seminar cum School, SINP, Kolkata, 2010.
- Passivation-selective growth and stability of Langmuir-Blodgett film on Si surface. [Talk] ICFANT, Jadavpur University, Kolkata, 2010.
- Organized a National Conference on Nanoscience & Nanotechnology (NS&NT-2014) at CRNN, University of Calcutta, 18-19 September 2014.
- A Top-Down Approach Towards Fabrication of Stable Polymer Ultrathin Films. [**Invited lecture**] EMSI, BARC, Mumbai, 8-10th July 2015.
- Fabrication of Stable Polymer Ultrathin Films (< 7 nm) by a Simple Top-Down Approach. [**Invited lecture**] DAE SSPS 2015, Amity University, Noida.
- "**INSPIRE Faculty Monitoring-cum-Interaction Meet**" in the subject area of Physical Sciences & Material Sciences at the Chandigarh University, Gharuan, Mohali from 10-11 FEB 2017

LABORATORY VISIT

1. Physics laboratory of University of Siegen, Siegen, Germany, 2009.
   Interfacial Instability Driven Growth of Low Dimensional Structures.[Talk]
2. Universite du Maine, Le Mans, France, May 4-31, 2016.

SUPERVISION

- I have supervised three master students of Universite du Maine in my present post doc tenure at France.
- Two Ph. D. students (Mr. Ikbal Ahmed and Mrs. Shreya Bhattacharya) are working in my DST-INSPIRE project (Amount: 35 Lakhs).

PROJECTS

- Project Title (No. : IFA 13 PH 79) "*Effect of Supercritical Fluid on Ultrathinnest Polymer Films"* (Funding agency: DST INSPIRE, Amount: 35 lakhs, Duration: 2014-2019).
- Project Title (No. : CRG/2018/002290) "*Anomalous Properties of Confined Films of Polymer and Polymer Nanocomposite"* (Funding agency: DST SERB, Amount: 33 lakhs, Duration: 2019-2022).

APPROVED SYNCHROTRON PROPOSAL

1. Proposal title: "Interaction mediated structural evolution of vitamin C-fatty acid hybrid ultrathin Films" [Proposal No. 20180333] at MCX beamline, ELETTRA, Italy, 2018.
2. Proposal title: "Controlling the structural ordering of Polystyrene blended C8-BTBT thin film" [Proposal No. 20180274] at MCX beamline, ELETTRA, Italy, 2018.
3. Proposal title: "X-ray reflectivity study of Chitosan-fatty acid hybrid Langmuir-Blodgett Films" [Proposal No. 20175257] at MCX beamline, ELETTRA, Italy, 2017.
4. Proposal title: "Role of Constituent Block and Substrate in Preferential Ordering and Swelling of Amphiphilic Block Copolymer Ultrathin Films" [Proposal No. 20165498] at MCX beamline, ELETTRA, Italy, 2017.
5. Proposal title: "Evolution of Metal/Polymer Hybrid Interfacial Nanostructures with Temperature" [Proposal No. 20151271] at DiffAbs beamline, SOLEIL, France, 2016.
6. Proposal title: "Au interdiffusion: As a probe of glass transition behavior for ultrathinnest polymer films" [Proposal No. 20155484] at MCX beamline, ELETTRA, Italy, 2016.
7. Proposal title: "In-situ Au diffusion study to probe the polymer chain mobility and glass transition temperature" [Proposal No. 20150399] at SAXS beamline, ELETTRA, Italy, 2015.
8. Proposal title: "CO_2 interaction with ultrathin polystyrene films" [Proposal No. 20120814] at SMIS beamline, SOLEIL, France, 2013.
9. Proposal title: "In-situ X-ray reflectivity and GISAXS measurement of the influence of SuperCritical CO_2 on CO_2 philic and CO_2 phobic surfactant templated silica and titania thin film" [Proposal No. SC-3686] at ID10 beamline, ESRF, France, 2013.
10. Proposal title: ""on chip" microreactor: a suitable tool for X-ray analysis within high pressure media" [Proposal No. SC-3632] at ID2 beamline, ESRF, France, 2013.

REFERENCES

Name, address, e-mail and telephone numbers of referees:

1. **Prof. Satyajit Hazra (Ph. D. supervisor)**
   Surface Physics and Material Science, Saha Institute of Nuclear Physics,
   1/AF Bidhannagar, Kolkata 700064, India.
   Email - satyajit.hazra@saha.ac.in, Telephone – 09432388178.

2. **Prof. Ashutosh Sharma**
   Secretary, Department of Science and Technology
   Email - ashutos@iitk.ac.in, Telephone – 011-26590412

3. **Prof. Dr. Sabu Thomas**
   Professor of Polymer Science & Technology & Hon. Director of
   International and Inter University Centre for Nanoscience and Nanotechnology, School of Chemical Sciences, Mahatma Gandhi University, Priyadarshini Hills P. O. Kottayam, Kerala, India -686 560
   E-mail: sabuchathukulam@yahoo.co.uk, Telephone – 09447223452.

4. **Prof. Milan K. Sanyal**
Surface Physics and Material Science, Saha Institute of Nuclear Physics,
1/AF Bidhannagar, Kolkata 700064, India.
Email – milank.sanyal@saha.ac.in

5. **Prof. D. D. Sarma**
Solid State & Structural Chemistry Unit, Indian Institute of Science,
Bangalore 560 012, India.
Email – sarma@sscu.iisc.ernet.in, Telephone – 09448463760

6. **Prof. Dhrubajyoti Chattopadhyay**
Ex-Pro-Vice Chancellor (Academic Affairs), Calcutta University and Director of CRNN,
Presently the VC of Amity University Kolkata branch.
Email - dhrubajyotic@gmail.com, Telephone – 09831083791.

7. **Prof. Alain Gibaud**
LUNAM Universite, IMMM, Faculte de sciences, Universite du Maine,
UMR 6283 CNRS, Le Mans Cedex 9, 72000, France.
Email – Alain.Gibaud@univ-lemans.fr

8. **Prof. Yves Grohens**
Universite´ Bretagne-Sud, EA 4250,
LIMATB, F-56100 Lorient, France.
Email - yves.grohens@univ-ubs.fr