


## Faculty Profile: For University Website

### DEPARTMENT OF PHYSICS

<b>Personal Information</b>	<p>Dr. Jayanta Kumar Baral          Department of Physics          Mobile: 9078694831          Email Id: <a href="mailto:jayanta(dot)baral(at)cuj(dot)ac(dot)in">jayanta (dot) baral (at) cuj (dot) ac (dot) in</a>          Orcid id: 0000-0002-5295-3589          Researcher ID: B-7601-2014          Scopus Author ID: 8665742100          Vidwan ID:          GoogleScholar: <a href="https://scholar.google.com/citations?user=O1-y_y8AAAAJ&amp;hl=en">https://scholar.google.com/citations?user=O1-y_y8AAAAJ&amp;hl=en</a></p>	
<b>Educational Qualification:</b>	<ul style="list-style-type: none"> <li>• Ph. D. ; Åbo Akademi University, FINLAND ; (2009)</li> </ul>	
<b>Courses Taught:</b>	<ul style="list-style-type: none"> <li>• Quantum Mechanics</li> <li>• Quantum Electronics</li> <li>• Condensed Matter Physics</li> <li>• Advanced Condensed Matter Theory</li> <li>• Physics of Materials and Devices</li> <li>• Classical Electrodynamics</li> <li>• Electronics</li> <li>• Applied Physics: General Properties of Matter</li> </ul>	
<b>Professional /Administrative Experience:</b>	<ul style="list-style-type: none"> <li>• UGC - Assistant Professor: Central University of Jharkhand, Ranchi, India (29th August 2018 - cont...)</li> <li>• Assistant Professor: KIIT University, Bhubaneswar, Odisha, India (1st August 2016 - 27th August 2018)</li> <li>• CNRS Research Fellow: University of Strasbourg, Strasbourg, FRANCE (18th August 2014 - 30th September 2015)</li> <li>• Postdoctoral Research Associate: University of Massachusetts (UMass), Amherst, USA (15th February 2012 - 24th June 2014)</li> <li>• Postdoctoral Fellow: Concordia University and University of Quebec At Montreal (UQAM), Montreal, Quebec, CANADA (02 November 2009 - 1st December 2011)</li> <li>• JRF: IIT Mumbai, India (9th January 2004 - 15th October 2004)</li> </ul>	
<b>Awards &amp; Honours</b>	<ul style="list-style-type: none"> <li>• CNRS Research Fellow: University of Strasbourg, Strasbourg, FRANCE (18th August 2014 - 30th September 2015)</li> <li>• Research work highlighted on the <b>Front Cover Gallery</b> of <i>J. Mater. Chem.</i> This published fine-artwork will be found here on the web of <i>J. Mater. Chem.</i> vol. <b>18</b>   issue 16   Pages 1821–1936   28 April 2008   <a href="http://pubs.rsc.org/en/content/articlepdf/2008/JM/B718227A">http://pubs.rsc.org/en/content/articlepdf/2008/JM/B718227A</a></li> <li>• Recipient of Best Poster award in “NanoTechnology in North Europe (NTNE 2006)” conference, Helsinki, FINLAND, 16 – 18 May 2006.</li> </ul>	
<b>Research Area:</b>	<ul style="list-style-type: none"> <li>• Charge Transport Studies, Energy Efficient Device Physics, Disordered Semiconducting Materials, Flexible Electronics</li> </ul>	

<b>Research Guidance:</b>	<p><b>M. Tech.: 02 (Awarded)</b></p> <ol style="list-style-type: none"> <li>1. Nano-Hybridization of PbS- QD/MWCNTs incorporated into P3HT:PCBM nanoblends towards near-infrared solar energy conversion &amp; alternative energy applications (Mr. Ankit Sharma, Univ of Quebec At Montreal (UQAM), Montreal, Quebec, CANADA, 5th Jan 2011; Awarded)</li> <li>2. Development of Organic Field-Effect Transistor Based Gas Sensors (Mr. Ugur Soysal, University of Strasbourg, FRANCE, 11th Sept 2015; Awarded).</li> </ol> <p><b>M. Sc.: 37 (Awarded: 35, Pursuing: 02)</b></p>
<b>Brief introduction:</b>	<p>Dr. Jayanta K. Baral has been working on transistor based sensors, low band-gap polymers for photovoltaic applications, charge transport studies in-plane and out-of-plane (i.e., face-on, and edge-on) orientations of ordered and disordered semiconductors, exciton lifetime studies, and time of flight (TOF) measurements and the ideal Donor–Acceptor block-co-oligomer systems for photovoltaics. Some of his works focus on Co-Crystal based charge transport devices, Organic/polymer opto-electronics, device physics, including floating gate memories and integrated circuits, and new device technologies. Fabrication and characterization of flexible polymer electronics using smart substrates for ICs, including polymer hybrid-transistors, Floating Gate Memory (FGM) devices, electroactive organic devices, organic light emitting diodes, hybrid photovoltaics, and to name a few in combination with NanoImprint Lithography (NIL) are being investigated. In particular, out of those above performed research topics, Dr. Jayanta emphasizes on one of his projects, i.e., "the transparent, mechanical flexible, and low-operating voltage smart FGMs. These FGMs are further being employed as artificial intelligence as these FGMs are the basic components in RFIDs. The RFID tags act as biosensors for biomedical applications in phototherapy, non-invasive examination, chemically and/or biologically sensitive. Since, the human bodily fluid such as sweat contains the biomolecules that indicate stress and fatigue upon transferring the biomolecules through sweat via microscopic channels and valves to the sensors to measure the change in concentration level. He is also working on Organic Photovoltaics based on Nano-Hybridized Quantum Dots/Multiwall Carbon Nanotubes incorporated into BHJ of Polymer/Fullerene nanoblends for near-infrared Photon to Electron/Current conversion; Charge Transport studies and Interface Engineering of Polymer Solar Cells to enhance the Power Conversion Efficiencies. He has also paid paramount importance to investigate the charge transport phenomenon by nano-engineering the interfaces of nano-hybrid PVs. In this way, the development of nanohybrid PV cells with high conversion efficiencies were accelerated and demonstrated. The opportunities to work on various research projects that were linked to industrial realization.</p>
<b>Articles Published/ Accepted:</b>	<p><b>Total Publications (16)</b></p> <p><i>List of Publications:</i></p> <p><i>Papers in peer-reviewed International Journals:</i></p> <ol style="list-style-type: none"> <li>1. H. S. Majumdar, J. K. Baral, R. Österbacka, O. Ikkala, &amp; H. Stubb, "Fullerene–based Bistable Devices and Associated Negative–Differential–Resistance effect", Organic Electronics 06 (04), 188 – 192, (2005).</li> <li>2. H. S. Majumdar, J. K. Baral, A. Laiho, J. Ruokolainen, O. Ikkala, &amp; R. Österbacka, "Memory Effect and Negative Differential Resistance by Electrode–induced Two–Dimensional Single–Electron Tunneling in Molecular and Organic Electronic Devices", Advanced Materials 18 (21), 2805 – 2806, (2006).</li> <li>3. J. K. Baral, H. S. Majumdar, A. Laiho, H. Jiang, E. I. Kauppinen, R. H. A. Ras, J. Ruokolainen, O. Ikkala, &amp; R. Österbacka, "Organic Memory using [6,6]–phenyl–C61 butyric acid methyl ester (PCBM): Morphology, Thickness and Concentration Dependence Studies", Nanotechnology 19 (03), 035203, (2008).</li> <li>4. D. Wei, J. K. Baral, R. Österbacka, &amp; A. Ivaska, "Memory Effect in Ionic Liquid Matrix containing Single Walled Carbon Nanotubes and Polystyrene", Nanotechnology 19 (05), 055203, (2008).</li> <li>5. D. Wei, J. K. Baral, R. Österbacka, &amp; A. Ivaska, "Electrochemical Fabrication of Nonvolatile</li> </ol>

- Memory Devices based on Polyaniline and Gold Nanoparticles”, J. Mater. Chem. 18 (16), 1853 – 1857, (2008).
6. A. Laiho, H. S. Majumdar, J. K. Baral, F. Jansson, R. Österbacka, & O. Ikkala, “Tuning the Electrical Switching of Polymer/Fullerene Nanocomposite Thin Film Devices by Control of Morphology”, Appl. Phys. Lett. 93, 203309, (2008).
  7. J. K. Baral, R. Izquierdo, M. Packirisamy, & V. –V. Truong, “Improved Polymer Solar Cell Performance by Engineering of Cathode Interface”, Euro. Phys. J. - Appl. Phys. 55 (03), 30202, (2011).
  8. D. Wang, J. K. Baral, H. Zhao, B. A. Gonfa, V. –V. Truong, M. A. Elkhakani, R. Izquierdo, & D. Ma, “Controlled Fabrication of PbS Quantum-Dot/Carbon-Nanotube Nano-Architecture and its Significant Contribution to Near Infrared Photon-to-Current Conversion”, Advanced Functional Materials 21 (21), 4010–4018, (2011).
  9. L. Zhang, N. S. Colella, F. Liu, S. Trahan, J. K. Baral, H. H. Winter, S. C. B. Mannsfeld, & A. L. Briseño, “Synthesis, Electronic Structure, Molecular Packing/Morphology Evolution, and Carrier Mobilities of Pure Oligo-/Poly(alkylthiophenes)”, J. Am. Chem. Soc. (JACS) 135 (02), 844–854, (2012).
  10. F. Liu, C. Wang, J. K. Baral, L. Zhang, J. J. Watkins, A. L. Briseño, & T. P. Russell, “Relating Chemical Structure to Device Performance via Morphology Control in Diketopyrrolopyrrole-Based Low Band Gap Polymers”, J. Am. Chem. Soc. (JACS) 135 (51), 19248–19259, (2013).
  11. M. R. Beaulieu §, J. K. Baral §, N. R. Hendricks, Y. Tang, A. L. Briseño, & J. J. Watkins, “Solution Processable High Dielectric Constant (k) Nanocomposites based on ZrO<sub>2</sub> Nanoparticles for Flexible Organic Transistors”, ACS – Appl. Materials & Interfaces (AMI) 05 (24), 13096–13103, (2013). § *Equal Contribution*.
  12. J. K. Baral, A. Sharma, D. Wang, D. Ma, V. –V. Truong, & R. Izquierdo, “Enhanced Photovoltaic Conversion Efficiency in Bulk Heterojunction Solar Cells upon Incorporating NanoHybridized PbS Quantum Dots/Multiwall Carbon Nanotubes”, Euro. Phys. J. - Appl. Phys. 65 (01), 10201, (2014).
  13. A. K. Singh, S. Srivastava, A. Mahapatra, J. K. Baral, & B. Pradhan, “Performance optimization of lead free-MASnI<sub>3</sub> based solar cells with 27% efficiency by numerical simulation”, Optical Materials 117, 111193, (2021).
  14. G. N. Nirala, J. B. Maurya, B. A. Kumar, J. K. Baral, “Numerical Investigation and Analysis of a Compact Photonic Crystal Fiber with Negative Dispersion”, Optoelectron. Adv. Mat. vol. 19, iss. 3-4 (2025).

***Papers in peer-refereed International Conference Proceedings:***

15. A. Laiho, J. K. Baral, H. S. Majumdar, D. Tobjörk, J. Ruokolainen, R. Österbacka, & O. Ikkala, “Imaging and Elemental Analysis of Polymer/Fullerene Nanocomposite Memory Devices” MRS Spring 2008 Symposium, San Francisco, California, USA, MRS Bulletin, Mater. Res. Soc. Symp. Proc., vol. 1071, F04 – 04, (2008).
16. A. Y. Mahmoud, J. Zhang, J. K. Baral, R. Izquierdo, D. Ma, M. Packirisamy, & V. –V. Truong, “Low Density of Gold Nanorods in the Anodic Layer for Enhancing the Efficiency of Organic Solar Cells”, Photonics North (May) 2011, Ottawa, Ontario, CANADA, International Society for Optical Engineering and Photonics, – Proc. SPIE. 8007, 80071V, (2011).

<b>Research Highlights:</b>	<ul style="list-style-type: none"> <li>• <b>Front Cover Gallery</b> of <i>J. Mater. Chem.</i> to represent my Ph.D work <b>highlights</b>. This published fine-artwork will be found here on the web of <i>J. Mater. Chem.</i> vol. <b>18</b>   <i>issue 16</i>   Pages 1821–1936   28 April 2008   <a href="http://pubs.rsc.org/en/content/articlepdf/2008/JM/B718227A">http://pubs.rsc.org/en/content/articlepdf/2008/JM/B718227A</a></li> </ul>
<b>Seminar/ Workshop/ Conference Participation:</b>	<p><b>International Conference/Workshop (<i>Selected</i>)</b></p> <ol style="list-style-type: none"> <li>1. More than 30 abstracts have been reported in various international conferences (for both oral &amp; poster presentations), and to name a few of them have been awarded for best poster presentations.</li> </ol> <p><b>Publication as abstract in International Conference/Workshop (<i>Selected</i>)</b></p> <ol style="list-style-type: none"> <li>1. R. Österbacka, J. K. Baral, H. S. Majumdar, F. Jansson, A. Laiho, R. H. A. Ras, J. Ruokolainen, O. Ikkala, H. Jiang, &amp; E. Kauppinen, "Organic memory devices using the negative differential resistance effect" 2008 APS March Meeting, New Orleans, Louisiana, USA, Bulletin of the American Physical Society, vol. 53 (02), (2008). Abstracts (of Papers of the APS) ID: BAPS.2008.MAR.V22.13.</li> </ol>
<b>Program Organized:</b>	<ul style="list-style-type: none"> <li>• Co-Convener for the 29th edition of the national conference “Condensed Matter Days 2021 (CMDAYS-21)” on Condensed Matter Physics organized in the department of physics, CUJ, Ranchi from 10th - 12th, 2021</li> <li>• Co-Convener for the National Seminar On Ferroelectrics and Dielectrics (XXIII NSFD - 2024)” organized in the department of physics, CUJ, Ranchi from 17th -19th, 2024</li> </ul>
<b>Any other information:</b>	<ul style="list-style-type: none"> <li>• Scientific reviewer for American Chemical Society (ACS), American Institute of Physics (AIP), Institute of Physics (IOP) Publishing, Elsevier Journals, &amp; European Physics Journals.</li> </ul>
<b>Updated as on</b>	14th February 2025