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| **Name: Brij Kishore**  | |
| **About You** | **Area of Expertise:** Investigating new electrode materials for sodium and potassium ion batteries, electrode making, coin, swagelok, & pouch cell development and testing, battery formation, development of novel electrolyte additives, exploring aqueous binders for electrode development and battery recycling<br><br>**Research Interest: Na-ion batteries, K-ion batteries, Battery formation, Battery recycling** |
| **Activities** | **Research and teaching** |
| **Publication & IPR(State only those which are relevant to your mandate and shows your strengths)** | SCI journals – 40; Book chapters – 2; Papers/posters presented in international/ national conferences – 9; Non-SCI journals – 1; Conference proceedings – 1; Total citations – 1112; h-index – 20.<br><br>Details of publications in the biodata (attached) |
| **Collaboration (Mention the companies/institutes (both national & international) with whom you have/had projects or executed technical; services)** | 1. **Petroleum Conservation Research Association,** Bhikaji Cama Bhawan, Bhikaji Cama Place, Rama Krishna Puram, New Delhi, Delhi- 110066, INDIA<br>2. **Centre for High Technology,** OIDB Bhawan, Tower 'A', 9th Floor, Plot No. 2, Sector- 73, Noida- 201301, INDIA<br>3. **Empyrean Global,** Adj. Mega Petro Mall, BPCL Petrol Pump, Sunam-Patiala Road, Sangrur- 148028, INDIA<br>4. **Punjab Mandi Board,** Punjab Mandi Bhawan, Sector 65-A, S.A.S. Nagar (Mohali)- 160062, INDIA<br>5. **Sardar Swaran Singh National Institute of Bio-Energy,** near Pushpa Gujral Science City, Wadala Kalan, Kapurthala- 144601, INDIA<br>6. **Department of Forest & Wild Life Preservation,** Forest Complex, Kumbra Road, Sector-68, S.A.S. Nagar (Mohali)- 140110, INDIA<br>7. **Post-Harvest Machinery & Equipment Testing Centre (PHMETC),** ICAR-CIPHET, P.O. PAU Campus, Ludhiana-141004, INDIA<br>8. **International Tractors Limited,** Vill. Chak Gurjran, P.O. Piplanwala Jalandhar road, Hoshiarpur- 146022, INDIA |
| **Contact Details** | **Email: brij.kishore@cmeri.res.in**<br>**Mobile: +91-7763963074** |

# BIODATA

a) Name: Brij Kishore

b) Date of Joining CMERI: 27/07/2022

c) Academic qualifications: B.Sc., M.S., Ph.D.

d) Email id: brij.kishore@cmeri.res.in

| Examination/ Degree | Board/ University | Subjects | Percentage/ CGPA | Year of passing |
|---|---|---|---|---|
| Integrated PhD (M.S. + PhD) | Indian Institute of Science | Applied materials electrochemistry | 6.5/8.0 | 2018 |
| B.Sc (Hons) | University of Delhi | Chemistry | 82.0 % | 2011 |

e) Areas of expertise: Investigating new electrode materials for sodium and potassium ion batteries, pouch cell development, battery formation, development of novel electrolyte additives, exploring aqueous binders for electrode development and battery recycling.

f) Experience:

| S. No. | Designation | Place of work | Duration | Areas of work |
|---|---|---|---|---|
| 1. | Scientist | CSIR-Central Mechanical Engineering Research Institute, Durgapur | 01/11/2024 to Till Date | Research and development of energy storage devices |
| 2. | Scientist | CSIR-CMERI Center of Excellence for Farm Machinery, Ludhiana | 27/07/2022 – 25/10/2024 | Development of bio-energy from agricultural/forest waste |
| 3. | Post-doctoral research fellow | University of Birmingham, United Kingdom | 18/06/2018 – 08/07/2022 | Development of Na-ion batteries for automotive applications and battery recycling techniques |

g) Publications: SCI journals – 40; Book chapters – 2; Papers/posters presented in international/ national conferences – 8; Non-SCI journals – 1; Conference proceedings – 1.

h) List of publications (last 10 years)

| S. No. | Research paper details |
|---|---|
| 1. | T. Song, **Brij Kishore**, Y. Lakhdar, L. Chen, P. Slater, E. Kendrick*, Effects of Storage Voltage upon Sodium-Ion Batteries*, **Batteries**, 2024, 10, 361. |
| 2. | Y. Chen, Y. Lakhdar, L. Chen, **Brij Kishore**, J. Choi, E. Williams, D. Spathara, R. Jackowska, E. Kendrick, *Accurate voltage prediction for lithium and sodium-ion full-cell development*, **Next Energy,** 2024, 5, 100166. |
| 3. | S. Roberts, L. Chen, **Brij Kishore**, C. Dancer, M. Simmons, E. Kendrick, *Mechanism of gelation in high nickel content cathode slurries for sodium-ion batteries*, **Journal of Colloid and Interface Science**, 2022, 627, 427-437. |
| 4. | L. Chen, **Brij Kishore**, T. Song, M. Walker, C. Dancer, E. Kendrick, *Improved lifetime of Na-ion batteries with a water scavenging electrolyte additive*, **Frontiers in Energy Research**, 2022, 10, 925430. |
| 5. | S. Ranganatha, **Brij Kishore**, N. Munichandraiah, *Facile one-pot solvothermal synthesis of NiCoP and its electrochemical performance as anode for lithium ion battery,* **Bulletin of Materials Science,** 2021, 44, 1-5. |
| 6. | T. Jayalakshmi, **Brij Kishore**, G. Nagaraju, *Mesoporous $Mo_4V_6O_{25}$ as high electrochemical performance anode material for lithium ion battery,* **Journal of Materials Science: Materials in Electronics,** 2021, 32, 1593-1601. |
| 7. | **Brij Kishore**, L. Chen, C. Dancer, E. Kendrick, *Electrochemical formation protocols for maximising the life-time of a sodium ion battery,* **Chemical Communications,** 2020, 56, 12925-12928. |
| 8. | L. Chen, **Brij Kishore**, M. Walker, C. Dancer, E. Kendrick, *Nanozeolite ZSM-5 electrolyte additive for long life sodium-ion batteries,* **Chemical Communications,** 2020, 56, 11609-11612. |
| 9. | K. N. Manukumar, **Brij Kishore**, R. Viswanatha, G. Nagaraju, *$Ta_2O_5$ nanoparticles as an anode material for lithium ion battery,* **Journal of Solid State Electrochemistry**, 2020, 24, 1067–1074. |
| 10. | J. M. Bray, C. L. Doswell, G. E. Pavlovskaya, L. Chen, **Brij Kishore**, H. Au, H. Alptekin, E. Kendrick, M.-M. Titirici, T. Meersmann, M. M. Britton, *Operando visualisation of battery chemistry in a sodium-ion battery by 23 Na magnetic resonance imaging,* **Nature Communications**, 2020, 11, 1-10. |
| 11. | B. Singh, S. Kumar, **Brij Kishore**, T. N. Narayanan, *Magnetic scaffolds in oil spill applications,* **Environmental Science: Water Research & Technology**, 2020, 6, 436-463. |
| 12. | S.B. Patil, M.S. Raghu, **Brij Kishore**, G. Nagaraju, *Enhanced electrochemical performance of few-layered $MoS_2$–rGO nanocomposite for lithium storage application*, **Journal of Materials Science: Materials in Electronics**, 2019, 30 316-322. |
| 13. | A. Abdel-Aziz, A.Y. Shenouda, MMS Sanad, **Brij Kishore**, HFY Khalil, MMB El-Sabbah, *Effect of ionic substitutions on the physicochemical, morphological, and electrochemical properties of lithium-rich vanadium phosphate and pyrophosphate compounds*, **Ionics**, 2019, 25, 969–980. |
| 14. | S.B. Patil, H. Phattepur, **Brij Kishore**, R Viswanatha, G Nagaraju, *Robust electrochemistry of black $TiO_2$ as stable and high-rate negative electrode for lithium-ion batteries*, **Materials for Renewable and Sustainable Energy**, 2019, 8, 10. |
| 15. | S.B. Patil, **Brij Kishore**, R Vishwanatha, G. Ebeling, G Nagaraju, *CdS@MoS2 core–shell nanospheres: a new electrode for lithium ion batteries*, **Journal of Materials Science: Materials in Electronics**, 2019, 30, 14456-14463. |

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| 16. | S.B. Patil, **Brij Kishore**, V. Reddy, G. Nagaraju, *Composition of MoO2 Nanoparticles with RGO Sheets as Improved Lithium Ion Battery Anode*, **ChemistrySelect,** 2018, 3, 13289-13296. |
| 17. | **Brij Kishore**, B. Singh, S. Kumar, *Graphene-based Nanocatalysts for Oxygen Reduction and Evolution Reactions in Metal-oxygen Batteries*, **Current Catalysis**, 2018, 7, 158-166. |
| 18. | K.N. Manukumar, **Brij Kishore**, K. Manjunath, G Nagaraju, *Mesoporous $Ta_2O_5$ nanoparticles as an anode material for lithium ion battery and an efficient photocatalyst for hydrogen evolution*, **International Journal of Hydrogen Energy**, 2018, 43, 18125-18135. |
| 19. | S.B. Patil, **Brij Kishore**, M.K. Nagaraj, N. Ganganagappa, U. Velu, *Mesoporous $MnMoO_4$ Nanorods for Enhanced Electrochemical Performance*, **ChemistrySelect**, 2018, 3, 7490-7495. |
| 20. | V. Daramalla, G. Venkatesh, **Brij Kishore**, N. Munichandraiah, S.B. Krupanidhi *Superior Electrochemical Performance of Amorphous Titanium Niobium Oxide Thin Films for Li-Ion Thin Film Batteries*, **Journal of the Electrochemical Society**, 2018, 165, A764 – A772. |
| 21. | R. Viswanatha, **Brij Kishore**, U. Bharatha, N. Munichandraiah, *Electrochemical Investigation of Plate like $Na_{2/3}Fe_{1/2}Mn_{1/2}O_2$ for Sodium Ion Cathode*, **Journal of the Electrochemical Society**, 2018, 165, A263 – A265. |
| 22. | S.P. Mohanty, **Brij Kishore**, N. Munichandraiah, *Composites of Sulfur-Titania Nanotubes Prepared by a Facile Solution Infiltration Route as Cathode Material in Lithium-Sulfur Battery*, **Journal of Nanoscience & Nanotechnology**, 2018, 18, 6830 – 6837. |
| 23. | S.B. Patil, **Brij Kishore**, K. Manjunath, V. Reddy, G. Nagaraju, *One step hydrothermal synthesis of novel Cu2S-MoO3 nanocomposite for lithium ion battery and photocatalytic applications*, **International Journal of Hydrogen Energy**, 2018, 43, 4003 – 4014. |
| 24. | K.N. Manukumara, G. Nagaraju, **Brij Kishore**, C. Madhu, N. Munichandraiah, *Ionic liquid-assisted hydrothermal synthesis of SnS nanoparticles: Electrode materials for lithium batteries, photoluminescence and photocatalytic activities*, **Journal of Energy Chemistry**, 2018, 27, 806 – 812. |
| 25. | S. B. Patil, Udayabhanu, **Brij Kishore**, G. Nagaraju, J. Dupont, *High Capacity $MoO_3$/rGO nanocomposite anode for Lithium ion batteries: An Intuition into Conversion Mechanism of $MoO_3$,* **New Journal of Chemistry**, 2018, 42, 18569-18577. |
| 26. | **Brij Kishore** and N. Munichandraiah, *Electrochemical impedance studies of Na/$MnO_2$ primary cells*, **Journal of Electroanalytical Chemistry**, 2017, 799, 134 – 141. |
| 27. | G. Venkatesh, **Brij Kishore**, R. Viswanatha, D. Aurbach, N. Munichandraiah, *P2-Type $Na_{0.67}Mn_{0.65}Fe_{0.20}Ni_{0.15}O_2$ Microspheres as a Positive Electrode Material with a Promising Electrochemical Performance for Na-ion batteries*, **Journal of the Electrochemical Society**, 2017, 164, A2176 – A2182. |
| 28. | S. Ghosh, A.D. Mania, **Brij Kishore**, N. Munichandraiah, R.P. Rao, L.L. Wong, S. Adams and P. Barpanda, *Autocombustion Synthesis of Nanostructured $Na_2Ti_6O_{13}$ Negative Insertion Material for Na-Ion*, **Journal of the Electrochemical Society**, 2017, 164, A1881 – A1886. |
| 29. | Udaybhanu, S. Muralikrishna, **Brij Kishore**, H. Nagabhushana, D. Suresh, S.C. Sharma and G. Nagaraju*, One pot green synthesis of MnCO3–rGO composite hybrid superstructure: application to lithium ion battery and biosensor*, **New Journal of Chemistry**, 2017, 41, 12854 – 12865. |
| 30. | S. Kumar, D. Kumar, **Brij Kishore**, S. Ranganatha, N. Munichandraiah and N.S. Venkataramanan, *Electrochemical Investigations of $Co_3Fe$-RGO as a bifunctional catalyst for oxygen reduction and evolution reactions in alkaline media*, **Applied Surface Science**, 2017, 418, 79 – 86. |

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| 31. | D. Shanmughasundaram, T.R. Penki, **Brij Kishore**, P. Barpanda, P.K. Nayak, D. Aurbach and N. Munichandraiah, *Porous, hollow $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$ microspheres as a positive electrode material for Li-ion batteries*, **Journal of Solid State Electrochemistry**, 2017, 21, 437 – 445. |
| 32. | S. Ranganatha, S. Kumar, T.R. Penki, **Brij Kishore** and N. Munichandraiah, *$Co_2(OH)_3Cl$ xerogels with 3D interconnected mesoporous structures as a novel high-performance supercapacitor material*, **Journal of Solid State Electrochemistry**, 2017, 21, 133 – 143. |
| 33. | **Brij Kishore**, G. Venkatesh and N. Munichandraiah, *High surface area, mesoporous, poorly crystalline $MnO_2$ with high $Na^+$ ion insertion capacity*, **Journal of Applicable Chemistry**, 2016, 5, 738 – 750. |
| 34. | **Brij Kishore**, G. Venkatesh and N. Munichandraiah, *$K_2Ti_4O_9$: A promising anode material for potassium ion batteries*, **Journal of the Electrochemical Society**, 2016, 163, A2551 – A2554. |
| 35. | T.R. Penki, D. Shanmughasundaram, **Brij Kishore**, A. V. Jeyaseelan, A. K. Subramani and N. Munichandraiah, *Composite of Li-rich Mn, Ni and Fe oxides as positive electrode materials for Li-ion battery*, **Journal of the Electrochemical Society**, 2016, 163, A1493 – A1502. |
| 36. | S. Kumar, **Brij Kishore** and N. Munichandraiah, *Electrochemical studies of non-aqueous Na-$O_2$ cells employing Ag-RGO as the bifunctional catalyst*, **RSC Advances**, 2016, 6, 63477 – 63479. |
| 37. | S. Shivakumara, **Brij Kishore**, T.R. Penki and N Munichandraiah, *Symmetric supercapacitor based on reduced graphene oxide in non-aqueous electrolyte*, **ECS Electrochemistry Letters**, 2015, 4, A87 – A89. |
| 38. | **Brij Kishore**, G. Venkatesh and N. Munichandraiah, *A Na/$MnO_2$ primary cell employing poorly crystalline $MnO_2$*, **Journal of the Electrochemical Society**, 2015, 162, A839 – A844. |
| 39. | **Brij Kishore**, D. Shanmughasundaram, T.R. Penki and N. Munichandraiah, *Coconut kernel-derived activated carbon as electrode material for electrical double-layer capacitors*, **Journal of Applied Electrochemistry**, 2014, 44, 903 – 916. |
| 40. | T.R. Penki, D. Shanmughasundaram, **Brij Kishore** and N. Munichandraiah, *High rate capability of coconut kernel derived carbon as an anode material for lithium-ion batteries*, **Advance Materials Letters**, 2014, 5, 184 – 190. |
| 41. | S. Shivakumara, **Brij Kishore**, T.R. Penki and N Munichandraiah, *Symmetric supercapacitor based on partially exfoliated and reduced graphite oxide in neutral aqueous electrolyte*, **Solid State Communications**, 2014, 199, 26 – 32. |

## List of Conference Publication

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|---|---|
| 1. | A. Rambabu, **Brij Kishore**, N. Munichandraiah, S. B. Krupanidhi and P. Barpanda, *$Na_2Ti_6O_{13}$ thin films as anode for thin film sodium ion batteries*, AIP Conf. Proc., 2017, DOI: 10.1063/1.4980519 |

## List of Book Chapter

| | |
|---|---|
| 1. | L. Chen**, Brij Kishore** and E. Kendrick, *Nanostructured materials for sodium-ion batteries,* in Nanomaterials for Electrochemical Energy Storage: Challenges and Opportunities, (eds R. Raccichini and U. Ulissi), 2021, Elsevier, DOI: 10.1016/B978-0-12-821434-3.00009-0 |
| 2. | **Brij Kishore**, S. P. Mohanty, and N. Munichandraiah, *Electrochemistry of Rechargeable Batteries Beyond Lithium-Based Systems,* in Nanomaterials for Electrochemical Energy Storage Devices, (eds P. Roy and S.K. Srivastava). 2019, John Wiley & Sons, DOI:10.1002/9781119510000.ch1. |

## i) Papers Presented in National/International Conferences, Symposium, Meetings

1. 4th International Conference on Recent Advances in Bio-Energy Research (ICRABR – 2023), 9 – 12 October, 2023, Sardar Swaran Singh National Institute of Bio-Energy Kapurthala, India. Paper presented on "Eco-Friendly recyclable adsorbent for biogas enrichment using Temperature Swing Adsorption"
2. International Conference on Sodium Batteries, 5 – 7 November, 2019, Naperville, USA. Paper presented on "Effect of Formation on the Performance of Sodium-Ion Batteries" (**Oral** and **Poster** presentation by **Brij Kishore**).
3. The second International Conference on Electrochemical Science and Technology, 10 – 12 August, 2017, Bengaluru, India. Paper presented on "Electrochemical Impedance Studies of Na/$MnO_2$ Primary Cells**" (Oral** presentation by **Brij Kishore;** awarded **BEST PAPER** prize**).**
4. The 82$^{nd}$ Annual Meeting of the Israel Chemical Society, 13 – 14 February, 2017, Tel Aviv, Israel. Paper presented on **"**Microspheres of P2-type $Na_{0.67}Mn_{0.65}Fe_{0.20}Ni_{0.15}O_2$ as Cathode Material with Enhanced Na-ion Battery Performance" **(Poster** presented by **Brij Kishore).**
5. Pacific Rim Meeting (PRiME) 2016, 2 – 7 October, 2016, Honolulu, Hawaii, USA. Papers presented were **a)** "Voltage Delay Action of Na Metal in Na/$MnO_2$ Non-Aqueous Cells" and **b)** "Facile Synthesis and Electrochemical Investigation of $Na_{0.67}Mn_{0.65}Fe_{0.20}Ni_{0.15}O_2$: A Positive Electrode Material for Na-ion Batteries" **(Posters** presented by **Brij Kishore)**.
6. International Conference on Materials for Sustainable Future (ICMSF 2016), 14 – 15 July, 2016, SASTRA university, Tamil Nadu, India. Paper presented on "$K_2Ti_4O_9$ : A Promising Anode Material For Potassium Ion Batteries" **(Oral** presentation by **Brij Kishore)**.
7. Recent Advances in Theoretical Chemistry, 8 – 9 July, 2016, Indian Institute of Science, Bengaluru, India. Paper presented on "Amorphous $MnO_2$ as a Host for Na-ion Insertion/deinsertion" **(Poster** presented by **Brij Kishore)**.
8. International Conference on Material Science & Technology (ICMTECH 2015), 1 – 4 March, 2015, University of Delhi, Delhi, India. Paper presented on "High surface area, mesoporous, poorly crystalline $MnO_2$ with high $Na^+$ ion insertion capacity" **(Poster** presented by **Brij Kishore)**.
9. International Conference on Electrochemical Science & Technology (ICONEST 2014), 7 – 9 August, 2014. Paper presented on "Coconut Kernel Derived Activated Carbons for Electrical Double-Layer Capacitors" **(Poster** presented by **Brij Kishore).**

## j) Schools/Workshops and Laboratory Visits

1. One week training program on "Biogas Technoloy and its Implementation" held at SSS-NIBE during October 17-21, 2022.
2. Two day workshop on Basic Rietveld Refinement Analysis organized by Department of Physics, Siddaganga Institute of Technology, Tumkur, Karnataka on 24th and 25th March 2017.
3. As part of India-Israel bilateral project, I have spent 3 weeks in Prof. Doron Aurbach's group at Bar-Ilan University, Ramat Gan, Israel from 27th Jan 2017.
4. Prof. Doron Aurbach's school on "Advances in Batteries and Supercapacitors" organized by the India Section of the Electrochemical Society in association with the Central Electrochemical Research Institute, Karaikudi, from 13 – 15 May, 2015.

5. 8th Annual Universitas 21 summer school on Conflict Resolution hosted by University College Dublin, from 11 – 19 July, 2011