

## BISHNU PRASAD THAPALIYA

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### SUMMARY

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Results-oriented synthetic chemist/electrochemist/material scientist with a proven track record in synthesis, formulation, and purification of molten salts for graphitization, ion separation, and energy storage, and synthesis of electrode materials (anode, cathode, and electrolytes- both liquids and solid polymer electrolyte) for energy storage technology. Authored 37 peer-reviewed conference/journal papers.

### TECHNICAL SKILLS

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Design and synthesis of Battery Materials (Electrolyte - solid/composite polymer electrolytes and ionic liquids, Electrode - anodes, cathodes, and their functionalization), synthesis, formulation, and purification of molten salt systems, Electrochemical Methods (CV, EIS, GITT), Battery Testing, Polymer Synthesis, Material Characterizations (XRD/Raman/SEM/EDS/TEM/FTIR/NMR/TGA/DSC/DMA/BET/GPC), Technical/proposal writing, MATLAB, Mathematica, Computational Chemistry, Microsoft office, PowerPoint, Excel, Origin, Igor-Pro.

### EDUCATION

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<b>University of Tennessee</b>	Knoxville, TN
PhD, Polymer Chemistry	May 2020
<b>The University of Akron</b>	Akron, OH
MS, Chemistry	May 2016
<b>Tribhuvan University</b>	Kathmandu, Nepal
MS, Chemistry	Dec 2012
<b>Tribhuvan University</b>	Kathmandu, Nepal
BS, Chemistry	Nov 2004

### EXPERIENCE

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<b>Oak Ridge National Laboratory</b>	Oak Ridge, TN
<i>Postdoctoral Research Associate</i>	From May 2020-Present

- Working on the formulation and purification of novel molten salt systems for graphitization, ion separations, energy storage, and conversion
- Developed molten salt assisted electrochemical graphitization of coal products and other amorphous carbon feedstocks for lithium-ion battery anode; achieved ~5 times higher capacity (~200 mAh g<sup>-1</sup>) than commercial graphite at fast charging condition (~5C)
- Developed electrochemical fluorination of high voltage high-capacity cathodes for lithium-ion battery applications
- Synthesis and fabrication of solid/composite polymer electrolytes, novel solvated ionic liquid electrolytes for energy storage applications
- 3 provisional patents submitted

<b>Oak Ridge National Laboratory</b>	Oak Ridge, TN
<i>Graduate Student</i>	From Sep 2017- Apr 2020

- Synthesized robust solid composite polymer electrolytes and successfully applied to rechargeable lithium metal batteries
- Developed Layer-by-Layer (LbL) assembly strategy to fabricate mechanically reinforced polymer gel electrolytes with ionic conductivities ~ 10<sup>-3</sup> Scm<sup>-1</sup>.
- Developed low-temperature electrochemical graphitization from different amorphous carbon feedstocks; achieved 90% energy saving, 50% cost reduction, and accelerated synthesis time from 3 weeks to 3 hours

## University of Tennessee

Graduate Teaching / Research Assistant

Knoxville, TN

From Aug 2016- May 2020

- Fabricated pseudo-solid electrolytes using ionic liquids; achieved 10-folds increased in mechanical strength and conductivity of  $\sim 10^{-3} \text{ S cm}^{-1}$
- Characterized the synthesized monomers, polymers, and ionic liquids using  $^1\text{H NMR}$ ,  $^{13}\text{C NMR}$ ,  $^{19}\text{F NMR}$ , FTIR, TGA, DSC, DMA, GPC

## The University of Akron

Graduate Teaching Assistant

Akron, OH

From Jan 2014- May 2016

- Conducted quantum computational calculation of small molecules; discovered vibrational conical intersection
- Computed molecular dynamics using state of arts of computational software (Gaussian, Molpro, Lammmps)

## Nepal Mega College

Chemistry Lecturer

Kathmandu, Nepal

From Sep 2012- Dec 2013

- Prepared course materials, instructed both theory and lab courses, planning and design of experiment, safe laboratory operations and protocols, demonstrates laboratory experiments, techniques, and skills for high school Chemistry students.

## Tribhuvan University

Graduate Student

Kathmandu, Nepal

From Sep 2009- Dec 2012

- Devised bio-adsorbent and investigated the effectiveness of the removal of metal ion from wastewater; achieved 95 % removal of Fe, Cr.

## AWARDS

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- Outstanding Graduate Teaching Assistant Award, Department of Chemistry at The University of Akron, 2015
- Burchfield Burrige Warner Fellowship in Polymer Chemistry (Honors Day 2020), Department of Chemistry, University of Knoxville, TN, 2020.

## PUBLICATIONS

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- Dhruvad Parikh, Charl J. Jafta, Bishnu P. Thapaliya, Jaswinder Sharma, Harry M Meyer III, Chris Silkowski, Jianlin Li;  $\text{Al}_2\text{O}_3/\text{TiO}_2$  coated separators: Roll-to-roll processing and implications for improved battery safety and performance. *J. Power sources. Chem. Lett.*, **507**, 2021, 230259.
- Yiman Zhang, Ethan C. Self, Bishnu P. Thapaliya, Raynald Giovine, Harry M Meyer III, Linze Li, Yuan Yue, Dongchang Chen, Wei Tong, Guoying Chen, Chongmin Wang, Raphaele Clement, Sheng Dai, Jagjit Nanda; Formation of LiF surface layer during direct fluorination of high-capacity Co-free disordered rock salt cathodes. *ACS Appl. Mater. Interfaces*, **13**, 2021, 38221-38228.
- Kun Liang Ray A. Mastumoto, Wei Zhao, Naresh C. Osti, Ivan Popov, Bishnu P. Thapaliya, Simon Fleishmann, Sudhajit Misra, Kaitlyn Prenger, Madhusudan Tyagi, Eugene Mamontov, Veronica Augustyn, Raymond R. Unocic, Alexei P. Sokolov, Sheng Dai, Peter T. Cummings, Michael Naguib; Engineering the interlayer spacing by pre-intercalation for high performance supercapacitor Mxene electrodes in room temperature ionic liquid. *Adv. Funct. Mater.*, **31**, 2021, 2104007.

- Tao Wang, Robert L. Sacci, Jiyuan Liang, Chi-Linh Do-Thanh, Juntian Fan, Hao Chen, Yifan Sun, Bishnu P. Thapaliya, Shannon M. Mahurin, Musen Zhou, Jianzhong Wu, Scott Wilfred Donne, Sheng Dai; Mechanistic insights of pore contributions in carbon supercapacitors by modified step potential electrochemical spectroscopy. *J. Electrochem. Soc.*, **168**, 2021, 060530.
- Bishnu P. Thapaliya, Nicolette G. Puskar, Samantha Slaymaker, Nicole Onishi Feider, Chi-Linh Do-Thanh, Jennifer A. Schoot, De-en Jiang, Craig M. Teague, Shannon M. Mahurin, Sheng Dai; Synthesis and characterization of macrocyclic ionic liquids for CO<sub>2</sub> separation. *Ind. Eng. Chem. Res.*, **60**, 2021, 8218-8226.
- Zhenzhen Yang, Tongyu Liu, Song Wang, Hao Chen, Xian Suo, Tao Wang, Bishnu P. Thapaliya, De-en Jiang, Ilya Popovs, Sheng Dai; Fabrication of ionic covalent triazine framework-linked membranes via a facile sol-gel approach. *Chem. Mater.*, **33**, 2021, 3386-3393.
- Naresh C. Osti, Bishnu P. Thapaliya, Sheng Dai, Madhusan Tyagi, Eugene Mamontov; Strong enhancement of nanoconfined water mobility by a structure breaking salt. *J. Phys. Chem. Lett.*, **12**, 2021, 4038-4044.
- Bishnu P. Thapaliya, Huimin Luo, Mengya Li, Wan-Yu Tsai, Harry M. Meyer III, John R. Dunlap, Jagjit Nanda, Ilias Belharouak, Sheng Dai; Molten salt assisted low-temperature electro-catalytic graphitization of coal chars. *J. Electrochem. Soc.*, **168**, 2021, 046504.
- Charl J. Jafta, Xiao-Guang Sun, Hailong Lyu, Hao Chen, Bishnu P. Thapaliya, William T. Heller, Matthew J. Cunnio, Richard T. Mayes, M. Parans Paranthaman, Sheng Dai and Craig A. Bridges; Insight into the solid electrolyte interphase formation in bis(fluorosulfonyl)imide based ionic liquid electrolytes. *Adv. Funct. Mater.*, **31**, 2021, 2008708.
- Bishnu P. Thapaliya, Huimin Luo, Phillip Halstenberg, Harry M. Meyer III, John R. Dunlap, Sheng Dai, Low-cost transformation of bio-mass derived carbon to high-performing nano-graphite via low-temperature electrochemical graphitization. *ACS Appl. Mater. Interfaces*, **13**, 2021, 4393-4401.
- Mengya Li, Wan-Yu Tsai, Bishnu P. Thapaliya, Harry M. Meyer III, Beth L. Armstrong, Huimin Luo, Sheng Dai, Jagjit Nanda, Ilias Belharouak; Modified coal char Materials with high-rate performance for battery applications. *Carbon*, **172**, 2021, 414-421.
- Bishnu P. Thapaliya, Charl J. Jafta, Ethan Self, Albina Y. Borisevich, Harry M. Meyer III, Craig A. Bridges, Jagjit Nanda, Sheng Dai; Synthesizing High Capacity Oxyfluoride Conversion Anodes by Direct Fluorination of MoO<sub>2</sub>. *ChemSusChem*, **13**, 2020, 3825-3834.
- Hailong Lyu, Jianlin Li, Tao Wang, Bishnu P. Thapaliya, Shuang Men, Runming Tao, Xiao-Guang Sun, Sheng Dai; Carbon coated porous titanium niobium oxides as anode materials of lithium-ion batteries for extreme fast charge applications. *ACS Appl. Energy Mater.*, **3**, 2020, 5657-5665.
- Charl J. Jafta, Craig A. Bridges, Yaocai Bai, Linxiao Geng, Bishnu P. Thapaliya, Harry M. Meyer III, Rachid Essehli, William T. Heller, Ilias Belharouak; Probing of Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> interface by operando small angle Neutron scattering upon lithium uptake. *ChemSusChem*, **13**, 2020, 3654-3661.
- Kai Liu, Qingqing Zhang, Bishnu P. Thapaliya, Xiao-Guang Sun, Fei Ding, Xingjing Liu, Jinli Zhang, Sheng Dai; In situ polymerized succinonitrile based solid polymer electrolytes for lithium-ion batteries. *Solid State Ion.*, **345**, 2020, 115159.

- Prashant Bagri, Bishnu P Thapaliya, Zhenzhen Yang, Wei Jiang, Dino Sulejmanovic, Huimin Luo, Sheng Dai; Electrochemically induced crystallization of amorphous materials in molten MgCl<sub>2</sub>: boron nitride and hard carbon. *Chem. Commun.*, **56**, 2020, 2783-2786.
- Bishnu P Thapaliya, Ivan Popov, Sheng Dai; A layer-by-layer (LbL) assembly strategy for reinforcing the mechanical strength of an ionogel electrolyte without affecting ionic conductivity. *ACS Appl. Energy Mater.*, **3**, 2020, 1265-1270. (published cover art in this issue)
- Bishnu P. Thapaliya, Chi-Linh Do-Thanh, Charl J. Jafta, Runming Tao, Hailong Lyu, Albina Y Borisevich, Shize Yang, Xiao-Guang Sun, Sheng Dai; Simultaneously boosting the ionic conductivity and mechanical strength of polymer gel electrolyte membranes by confining ionic liquids into hollow silica nanocavities. *Batteries & Supercaps.* **2**, 2019, 985-991.
- Zihao Zhang, Shize Yang, Xiaobing Hu, Haidi Xu, Honggen Peng, Miaomiao Liu, Bishnu Prasad Thapaliya, Kecheng Jie, Jiahua Zhao, Jixing Liu, Hao Chen, Yan Leng, Xiuyang Lu, Jie Fu, Pengfei Zhang, Sheng Dai; A mechanochemical non-hydrolytic sol-gel-strategy for the production of mesoporous multi-metallic oxides. *Chemistry of Materials*, **31**, 2019, 5529-5536.
- Wan-Yu Tsai, Jeremy Come, Wei Zhao, Runxi Wang, Guang Feng, Bishnu P Thapaliya, Sheng Dai, Liam Collins, Nina Balke; Hysteretic Order-disorder transitions of ionic liquid double-layer structure on graphite. *Nano Energy*, **60**, 2019, 886-893.
- Bishnu P. Thapaliya, Charl J. Jafta, Hailong Lyu, Jiexiang Xia, Harry M. Meyer III, M. Parans Paranthaman, Xiao-Guang Sun, Craig A. Bridges, and Sheng Dai; Fluorination of Mxene by elemental F<sub>2</sub> as electrode material for lithium-ion batteries. *ChemSusChem*, **12**, 2019, 1316-124 (published on the front cover in this issue)
- Prashant Bagri, Huimin Luo, Ilja Popovs, Bishnu P Thapaliya, Jeremy Dehaut, Sheng Dai; Trimethyl phosphate-based neutral ligand room temperature ionic liquids for electrodeposition of rare earth elements. *Electrochem. Comm.* **96**, 2018, 88-92.
- Yongfen Tong, Hailong Lyu, Yuzhong Xu, Bishnu Prasad Thapaliya, Peipei Li, Xiao-Guang Sun, Sheng Dai; All-solid-state interpenetrating network polymer electrolytes for long cycle life of lithium metal batteries. *J. Mater. Chem A*, **6**, 2018, 14847-14855.
- RM Lees, Li-Hong Xu, BG Guislain, EM Reid, S Twagirayezu, DS Perry, MB Dawadi, BP Thapaliya, BE Billingham; Torsion-rotation structure and quasi-symmetric-rotor behavior for the CH<sub>3</sub>SH asymmetric CH<sub>3</sub>-bending and CH stretching bands of E parentage. *J Mol. Spec.*, **343**, 2018, 18-27.
- Mahesh B Dawadi, Bishnu P Thapaliya, David S Perry; An extended E⊗e Jahn-Teller Hamiltonian for the large-amplitude motion: Application to vibrational conical intersections in CH<sub>3</sub>SH and CH<sub>3</sub>OH. *J Chem. Phys.*, **147**, 2017, 044306.
- BG Guislain, EM Reid, RM Lees, Li-Hong Xu, S Twagirayezu, DS Perry, BP Thapaliya, MB Dawadi, BE Billingham; Giant K-doubling and in-plane/out-of-plane mixing in the asymmetric methyl-bending bands of CH<sub>3</sub>SH. *J Mol. Spec.*, **335**, 2017, 37-42.
- Bishnu P Thapaliya, Mahesh B Dawadi, Christopher Ziegler, David S Perry; The Vibrational Jahn-Teller effect in E⊗e systems. *Chem Phys.*, **460**, 2015, 31-42.

## MANUSCRIPTS UNDER REVIEW AND PREPARATION

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- Bishnu P Thapaliya, Sudhajit Misra, Shize-Yang, Charl J. Jafta, Harry M Meyer III, Prashant Bagri, Raymond R. Unocic, Craig A. Bridges, Sheng Dai; Enhancing cycling stability and capacity retention of NMC811 cathodes by reengineering interfaces via electrochemical fluorination. (Advanced Materials Interfaces, under revision)
- Tao Wang, Huimin Luo, Juntian Fan, Bishnu P. Thapaliya, Yaocai Bai, Ilias Belharouak, Sheng Dai; Flux upcycling of spent NMC111 to nickel-rich NMC cathodes in reciprocal ternary molten salts. (Under review iscience).
- Bishnu P Thapaliya, Albina Y Boresevich, Harry M Meyer III, Sheng Dai; Conformal LiF stabilized interface formation via electrochemical fluorination on high voltage spinel cathodes (~4.9 V) for LIBs. Manuscript ready for submission.
- Bishnu P. Thapaliya, Huimin Luo, Sheng Dai; Molten salt assisted electrochemical graphitization of amorphous carbon for practical application. Manuscript under preparation.
- Bishnu P Thapaliya, Charl J Jafta, Hao Chen, Albina Y Borisevich, Parans Paranthaman, Xiao-Guang Sun, Craig A Bridges, Sheng Dai; Lithium Doped High Entropy Oxide (HEO) Anodes: A Novel Approach to Enhanced Electrochemical Performances. Manuscript under preparation.
- Bishnu P Thapaliya, Ethan C Self, Charl J Jafta, Harry M Meyer III, Albina Y Borisevich, Jagjit Nanda, Sheng Dai; Enhancing the capacity and stability of conversion anodes by introducing fluoride/oxyfluoride phases via direct fluorination. Manuscript under preparation.

## CONFERENCES TALKS/POSTERS

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- **Charl J. Jafta**, Bishnu P Thapaliya, Hailong Lyu, Jiexiang Xia, Harry M. Meyer III, M. Parans Paranthaman, Xiao-Guang Sun, Craig A. Bridges, and Sheng Dai; Fluorination of mxene by elemental F<sub>2</sub> as electrode for lithium-ion batteries. Abstracts of papers of 235<sup>th</sup> the Electrochemical Society, May 2019.
- **Bishnu P Thapaliya**, Chi-Linh Do-Thanh, Charl J Jafta, Ronnie Tao, Xiao-Guang Sun, Sheng Dai; Novel composite polymer electrolytes with superior ionic conductivity with nanodomain of ILs in polymer matrix for highly reversible solid-state lithium metal batteries (LMBs). Abstracts of papers of 257<sup>th</sup> American Chemical Society, March 2019.
- **Chi-Linh Do-Thanh**, Bishnu P Thapaliya, Ilja Popovs, Sheng Dai; Dicationic cyclic ionic liquids for energy applications. Abstracts of papers of 257<sup>th</sup> American Chemical Society, March 2019.
- **Bishnu P Thapaliya**, Chi-Linh Do-Thanh, Hailong Lyu, Xiao-Guang Sun, Sheng Dai; Synthesis of lithium-ion conducting solid polymer electrolyte membranes for energy-related applications. Abstracts of papers of 255<sup>th</sup> American Chemical Society, March 2018.
- **Weida Shan**, Bishnu P Thapaliya, Chi-Linh Do-Thanh, Sheng Dai; Facile synthesis of porous liquids with a tunable pore size as promising media for gas separation. Abstracts of papers of 254<sup>th</sup> American Chemical Society, August 2017.
- **Bishnu P Thapaliya**, Xiaoguang Sun, Nanqing Chen, Chi-Linh Do-Thanh, Sheng Dai; Fabrication of Lithium-ion Conducting Solid Polymer Electrolyte Membranes for High-Performance Lithium Metal Batteries. RE3 workshop May 2017.
- **Bishnu P Thapaliya**, David S Perry; Variation of CH Stretch Frequencies with CH<sub>4</sub> orientation in the CH<sub>4</sub>-F<sup>-</sup> complex: Multiple resonances as vibrational conical intersections. 71<sup>st</sup> International Symposium on Molecular Spectroscopy, June 2016.

- **Ronald M Lees**, Li-Hong Xu, Elias M Reid, Bishnu P Thapaliya, Mahesh B Dawadi, David S Perry, Sylvestre Twagirayezu, Brant E Billingham; FTIR synchrotron spectroscopy of asymmetric CH stretching bands of methyl mercaptan (CH<sub>3</sub>SH)- a perplexity of perturbations. 71<sup>st</sup> International Symposium on Molecular Spectroscopy, June 2016.
- Mahesh B Dawadi, **Bishnu P Thapaliya**, Ram Bhatta, David S Perry; Vibrational Jahn-Teller effects in non-degenerate electronic states. 70<sup>th</sup> International Symposium on Molecular Spectroscopy, June 2015.
- **Mahesh B Dawadi**, Bishnu P Thapaliya, Ram Bhatta, David S Perry; Vibrational conical intersections: Implications for ultrafast vibrational dynamics. Abstracts of papers of American Physical Society, March 2015.