Dr. Harekrushna Behera
Postdoctoral Research Fellow, Centre for water and the Environment,
Department of Civil, Architectural and Environmental Engineering, and McKetta Department of Chemical Engineering, The University of Texas at Austin, USA.
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ACADEMIC AND RESEARCH EXPERIENCE:

Post-doctoral Research Fellow: The University of Texas at Austin, USA (March 2021-present)
Advisor: Prof. Manish Kumar, Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin, USA.
Co-Advisor: Prof Nathaniel Lynd, McKetta Department of Chemical Engineering, UT Austin.

- Engineering of nanopores and nanopore incorporated membranes for ion separation and purification;
- Organic synthesis,
  - Synthesis of Supramolecular channels,
  - Synthesis of block co-polymers through anionic polymerization;
- Establishing international collaborations;
- Established and managed a research laboratory for electrophysiology set up (patch clamp) to measure single channel current for ion channels;
- Artificial and biological channel characterization;
- Electrochemical measurement of membranes to evaluate their ion selectivity;
- Mentoring graduate students.

Post-doctoral Research Associate: Fudan University, Shanghai, China (Sep 2018-Aug 2020)
Advisor: Prof. Jun Li Hou, Department of Chemistry, Fudan University.

- Engineering of gated/ responsive ion channels for cell membrane ion transport and its application towards to selectively kill cancer cells without affecting healthier cells;
- Synthesizing organic molecules and peptides for artificial ion channels;
- Designing various vesicle based spectroscopic assays for studying mechanism of ion transport across the lipid bilayer;
- Stopped flow assays for evaluating ion/water transport across the membrane.

Project Research Scientist: IIT Bombay, India (Sep 2017-March 2018)
Advisor: Prof. Nandita Madhavan, Department of Chemistry, IIT Bombay, India.

- Macrocyclic amide-based scaffolds for gated transmembrane ion channels across the cell membrane;
- Peptide synthesis and synthesizing small organic molecules for artificial ion channels;
- Internally functionalized pore incorporated membranes for ion separation.

EDUCATION:

Ph.D.: (2011-2017): Indian Institute of Technology (IIT) Madras, India.

Specialization: Organic Chemistry

- ❖ Synthetic peptide Chemistry & Ion transport through robust internally functionalized channels and carriers across the cell membrane;
- ❖ Synthesizing organic molecules and peptides for artificial ion channels;
- ❖ Supramolecular Chemistry, Macrocyclic Chemistry;
- ❖ Mentoring Ph.D. students and supervise several other junior researchers in the group.

Ph.D. thesis title: "Methyl-6-(aminomethyl)-benzoate/picolinate derived Ion Transporters"

Advisor: Prof. Nandita Madhavan, Department of Chemistry, IIT Madras, India.

M.Sc: (2008-2010): Ravenshaw University, Cuttack, Odisha, India.

Specialization: Advanced Organic Chemistry (University 2nd rank).

INTERNATIONAL RESEARCH PUBLICATIONS

(1) **Behera, H.**; Duncan, T. J.; Samineni, L.; Oh, H.; Ganesan V.;* Kumar, M.* Lanthanide selective supramolecular membrane channels, *Manuscript submitted.*

(2) Oh, H.; Tu Y. M.; Samineni, L.; Respino S. D.; Mehrafrooz, B.; Joshi, H.; Massenburg, L.; Marques, H. L.; Elessawy, N.; Song, W.; **Behera, H.**; Boorla, V. S.; Kher, K.; Lin, Y. C.; Maranas, C.; Aksimentiev, A.; Freeman, B. D.; Kumar, M.* Dehydrated biomimetic membranes with skin-like structure and function. *Manuscript submitted.*

(3) Wachlmayr J.; Samineni L.; Denis G.; Knyazev D. G.; Barta T.; Speletz A.; Yao C.; Oh H.; **Behera H.**; Ren T.; Manish Kumar M.;* Horner A.* Biophysical quantification of unitary solute and solvent permeabilities to enable translation to membrane science. *J. Membr. Sci.* **2022**, 121308. DOI: https://doi.org/10.1016/j.memsci.2022.121308.

(4) Song, W.; Park, J.; Dasgupta, S.; Yao, C.; Maroli, N.; **Behera, H.**; Yin, X.; Acharya, D. P.; Zhang, X.; Doherty, C. M.; Maiti, P. K.; Freeman, B. D.*; Kumar, M.* "Scalable Pillar[5]arene-Integrated Poly(arylate-amide) Molecular Sieve Membranes to Separate Light Gases" *Chem. Mater.* **2022**, *34*, 14, 6559–6567.

(5) **Behera, H.***; Hou, J. L* "Pillar[n]arenes: Chemistry and Their Material Applications'' *chin. J. chem*. **2020**,*38*, 215–217.

(6) Benke, B. P.; **Behera, H**.; Madhavan, N.* "Low Molecular Weight Di- to Tetrapeptide Transmembrane Cation Transporters'' *Eur. J. Org. Chem.* **2020**, *2020(44), 6898-6902.*

(7) Chen, J. Y.; Xiao, Q.; **Behera, H.**; Hou, J. L.* "Unimolecular artificial transmembrane channel with terminal dihydrogen phosphate groups showing transport selectivity for *ammonium'' Chin. Chem. Lett.* **2020,** *31*, 77-80.

(8) Hou, J. L.; **Behera, H***.; "Macrocycle Based Synthetic Ion Channels, Handbook of Macrocyclic Supramolecular Assembly'' ***Book chapter****, Springer, Singapore,* ***2019,*** *pp 1-36.* doi.org/10.1007/978-981-13-1744-6_64-1

(9) **Behera, H**.; Madhavan, N.* "Anion-Selective Cholesterol Decorated Macrocyclic Transmembrane Ion Carriers'', *J. Am. Chem. Soc.*, **2017***, 139 (37),* 12919–12922.
"This Paper has been recognized in **JACS Young Investigators Virtual Issue** based upon the **outstanding work of young investigators** published in the Journal of the American Chemical Society in 2017. https://pubs.acs.org/page/jacsat/vi/young-investigator2018.html "

(10) **Behera, H.;** Ramkumar, V.; Madhavan, N.* "Triamide macrocyclic chloride receptors via a one-pot tandem reduction-condensation-cyclization reaction'' *Org. Biomol. Chem*, **2017**,*15*, 4937–4940.

(11) **Behera, H.;** Ramkumar, V.; Madhavan, N.* "Cation-transporting peptides: scaffolds for functionalized pores?*", Chem. Eur. J.* **2015**, *21*, 10179–10184.

ORAL and INVITED TALKS

(i) **Behera, H.;** and Kumar M.*, "Biomimetic Artificial Water Channels for Lanthanide Separations". **Invited Talk** at **Membranes: Materials and Processes, Gordon Research Conference**, Colby-Sawyer College in New Hampshire, United States, 31st July-5th Aug2022

(ii) **Behera, H.;** and Madhavan, N.*, "*Cation Transporting Peptidic Ion Channels: Scaffolds for Internally Functionalized Pores?*" **Invited talk** in the science academics lecture workshop on ***Frontiers in material science*** held at Department of chemistry, Ravenshaw University, Cuttack, Odisha, January, 2017.

(iii) **Behera, H.;** and Madhavan, N.*, "*Peptidic Scaffolds for Internally Functionalized Ion Channels*". **Oral presentation** at Chemistry in House Symposium, IIT madras, Chennai, August, 2015

POSTERS PRESENTED IN CONFERENCES AND SYMPOSIA

(i) **Behera, H.;** and Kumar M.*, "Biomimetic Artificial Water Channels for Lanthanide Separations". **Poster presented** at **Membranes: Materials and Processes, Gordon Research Conference**, Colby-Sawyer College in New Hampshire, United States, 31st July-5th Aug2022

(ii) **Behera, H.;** and Madhavan, N.*, "*Methyl-6-(aminomethyl)-picolinate derived Substituted Macrocycles as Artificial Ion Transporters*". **Poster presented** at **International Symposium on Macrocyclic and Supramolecular Chemistry**, **South Korea, July 2016**.

(iii) **Behera, H.;** and Madhavan, N.*, "*Small Peptidic Scaffolds for Internally Functionalized Pores*". **Poster presented** at RSC ROADSHOW AND SYMPOSIUM- 2014 , IIT Madras, Chennai, November, 2014.

(iv) **Behera, H.;** and Madhavan, N.*, "*Octapeptides Derived from Methyl(aminomethyl)benzoate and Alanine as Artificial Ion transporters*." **poster presented** at Chemistry in House Symposium, IIT madras, Chennai, August, 2013.

CURRENT GRANT SUPPORT

1) Project/Proposal Title: *Support for research and related activities on recovery of nutrients from Wastewater*

Source of Support: WoodNext Foundation

Total Award Amount: $ 710,000

Period of Performance: 01/2023 – 01/2024

Role: Grant writing and project planning/management

PI: Manish Kumar, The University of Texas at Austin

Location of Project: University of Texas at Austin, Austin, TX.

2) Project/Proposal Title: *Transport and Molecular Discrimination in Biomimetic Artificial Water Channels for Lanthanide Separations*

Source of Support: Department of Energy

Total Award Amount: $850,000

Period of Performance: 09/2022 – 08/2025

Role: Grant writing and project planning/management

PI: Manish Kumar, The University of Texas at Austin

Location of Project: University of Texas at Austin, Austin, TX.

3) Project/Proposal Title: *EFRI ELiS: Three-Dimensional Printable BioReactors For Sustainable Rare Earth Element Recovery*

Source of Support: National Science Foundation

Total Award Amount: $ 2,000,000

Period of Performance: 08/2022 – 07/2026

Role: Grant writing and project planning

PI: Manish Kumar, The University of Texas at Austin

Location of Project: University of Texas at Austin, Austin, TX.

RESEARCH SKILLS

❖ As a Synthetic organic and Bio-organic Chemist; acquired skill in synthesizing organic molecules and peptides. Performing organic reactions in both small and large scale;

❖ Familiar with Schleck techniques and glovebox for handling hygroscopic and air sensitive reagents and reactions;

❖ Gained expertise in purification of organic compounds through column chromatography,

RP-HPLC, crystallization and precipitation techniques;

- ❖ Gained expertise in anionic polymerization reactions to synthesize block co-polymers;
- ❖ Proficient in handling single channel conductance measurements (through patch clamp), Stopped flow and Spectrofluorometer for evaluating ion/water transport through artificial and biological channels across the membrane;
- ❖ Gained expertise in Potentiometry, FT-NMR, FT-IR, GC-MS, UV-Vis, DLS and SEM;
- ❖ Electrochemical measurement of membranes to evaluate their ion selectivity;
- ❖ Acquired skill in Biophysical assays such as vesicle based ion transport assays and host-guest chemistry (ion binding studies).
- ❖ Gained expertise in fabricating channel incorporated polymeric membranes for ion separation.

TEACHING AND LEADERSHIP EXPERIENCE

- ❖ Worked as a teaching assistant for "Chemistry Laboratory and Theory" courses for M.Sc & B. Tech students during 2012-2014 at IIT Madras
- ❖ Successfully trained one M.Sc. students towards completing their project and mentored six Ph.D. students and supervise several other junior researchers in the group.

AWARDS RECEIVED

2002-2003:	Orissa State Talent Scholarship	Qualified Orissa state talent Scholarship examination in the year **2002**, 9th class.
2005-2008:	N. Mohanthy Memorial Award	Awarded for Best Science graduate **2005-2008** from Khaira College, Orissa, India.
2005-2008:	Nishakar Samal Memorial Award	Awarded for securing highest marks in Math. in 2005-2008 from Khaira College, Orissa, India
2005-2008:	K. L Send Memorial award	Awarded for securing highest marks in Chemistry (Hons) in **2005-2008** from Khaira College, Orissa, India
2011:	Graduate aptitude test in engineering (**GATE-2011**),	Obtained **97.5** percentile and **266** all India rank in **GATE**, National level exam conducted by Indian Institute of Technology, Madras, India.
2011:	Junior Research Fellowship (**CSIR-UGC-JRF**)	Awarded "**Junior Research Fellow**" with **89** all India rank in the National level exam conducted by ***CSIR UGC-NET***, India.

2019-2020: International scholar exchange Fudan University, Government of China.