

# Christopher G. Arges, Ph.D

3307 Patrick Taylor Hall, LSU, Baton Rouge, LA 70803 | [carges@lsu.edu](mailto:carges@lsu.edu) | U.S. Citizen | <http://sites01.lsu.edu/faculty/carges/>

## PROFESSIONAL EXPERIENCE

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**Louisiana State University – Cain Department of Chemical Engineering** Baton Rouge, LA  
*Gordon A. and Mary Cain Professorship – Assistant Professor* Jan 2016 - current

**University of Chicago – Pritzker School for Molecular Engineering** Chicago, IL  
**Argonne National Laboratory – Materials Science Division** Argonne, IL  
*Postdoctoral Scholar (UChicago)* Oct 2013 – Dec 2015  
*Postdoctoral Research Associate (Argonne)* Jul 2014 – Dec 2015  
Project: Directed self-assembly of block copolymer electrolytes for energy conversion and storage  
Adviser: Professor Paul F. Nealey

**Baxter International, Inc.** Round Lake, IL  
*Research Associate II* Jul 2007 – Aug 2009  
Project: Product development of combinatorial drug delivery-medical devices; Continuum mathematical modeling of drug solution interactions with medical plastics

**Hospira, Inc. (now a part of Pfizer)** Clayton, NC  
*Associate Scientist (promoted from Assistant Scientist)* Jun 2005 – Jun 2007  
Project: R&D lead for transfer of 80 drug product codes from one manufacturing plant to another; initiated process analytical technology (PAT) program for in-line monitoring of chemical processes

## EDUCATION

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**Illinois Institute of Technology** Chicago, IL  
*Doctoral of Philosophy in Chemical Engineering* Aug 2009 – Sep 2013  
Dissertation: Structure-property relationships in anion exchange membranes for electrochemical energy conversion and storage  
Adviser: Professor Vijay Ramani (now at Washington University St. Louis)

**North Carolina State University** Raleigh, NC  
*Master of Science in Chemical Engineering (non-thesis)* May 2006 – Dec 2008

**University of Illinois** Urbana-Champaign, IL  
*Bachelor of Science in Chemical Engineering* Aug 2001 – May 2005  
Thesis: Steady-state and time-resolved fluorescence for studying electron energy transfer mechanisms in organic dendrimers and DNA  
Adviser: Professor Christopher J. Bardeen (now at University of California Riverside)

## PUBLICATIONS – <https://scholar.google.com/citations?user=AQG8WlcAAAAJ&hl=en>

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*Ten most relevant publications from my group; a = corresponding author*

10. Q. Lei, K. Li, D. Bhattacharya, J. Xiao, S. Kole, Q. Zhang, J. Strzalka, J. Lawrence, R. Kumar, and C.G. Arges<sup>a</sup>, Counterion condensation or lack of solvation? Understanding the activity of ions in thin film block copolymer electrolytes, *Journal of Materials Chemistry A*, **2020**, (accepted, in press), <https://doi.org/10.1039/D0TA04266H>, (note: Part of the themed collection for Journal of Materials Chemistry A Emerging Investigators Issue)

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9. A. Chaichi\*, G. Venugopalan\*, C.G. Arges<sup>a</sup>, and M.R. Gartia, A solid-state and flexible supercapacitor that operates across a wide temperature range, *ACS Applied Energy Materials*, **2020**, 3, 5693, <https://doi.org/10.1021/acsaem.0c00636> \*contributed equally to the article
8. V.M. Palakkal, T. Nguyen, P. Nguyen, M. Chernova, J.E. Rubio, G. Venugopalan, M. Hatzell, X. Zhu, and C.G. Arges<sup>a</sup>, A high power thermally regenerative ammonia-copper redox flow battery enabled by a zero gap cell design, low-resistant membranes and electrode coatings, *ACS Applied Energy Materials*, **2020**, 3, 4787, <https://doi.org/10.1021/acsaem.0c00400>
7. M.L. Jordan\*, L. Valentino\*, N. Nazyrynbekova, V.M. Palakkal, S. Kole, D. Bhattacharya, Y.J. Lin, and C.G. Arges<sup>a</sup>, Promoting water-splitting in Janus bipolar ion-exchange resin wafers for electrodeionization, *Molecular Systems Design & Engineering*, **2020**, 5, 922. <https://doi.org/10.1039/C9ME00179D> \*contributed equally to the article (note: Invited Contribution to the themed issue on Molecular Engineering for Water Technologies)
6. V.M. Palakkal\*, L. Valentino\*, Q. Lei, S. Kole, Y.J. Lin, and C.G. Arges<sup>a</sup>, Advancing electrodeionization with conductive ionomer binders that immobilize ion-exchange resin particles into porous wafer substrates, *npj Clean Water*, **2020**, 3, article 5, <https://doi.org/10.1038/s41545-020-0052-z> \*contributed equally to the article
5. G. Venugopalan, K. Chang, J. Nijoka, S. Livingston, G.M. Geise, and C.G. Arges<sup>a</sup>, Stable and highly conductive polycation-polybenzimidazole membrane blends for intermediate temperature proton exchange membrane fuel cells, *ACS Applied Energy Materials*, **2020**, 3, 573, <http://dx.doi.org/10.1021/acsaem.9b01802>
4. Z. Su\*, S. Kole\*, V.M. Palakkal, L. Harden, C.-o. Kim, G. Nair, C.G. Arges<sup>a</sup>, J.N. Renner, Peptide-modified electrode surfaces for promoting anion exchange ionomer microphase separation and ionic conductivity, *ACS Materials Letters*, **2019**, 1, 467, <http://dx.doi.org/10.1021/acsmaterialslett.9b00173> \*contributed to article equally
3. V.M. Palakkal, J.E. Rubio, Y.J. Lin, and C.G. Arges<sup>a</sup>, Low resistant ion-exchange membranes for energy efficient membrane capacitive deionization, *ACS Sustainable Chemistry & Engineering*, **2018**, 6, 13778, <http://dx.doi.org/10.1021/acssuschemeng.8b01797>
2. C.G. Arges<sup>a</sup> and L. Zhang, Anion Exchange Membranes' evolution towards high hydroxide ion conductivity and alkaline resiliency, *ACS Applied Energy Materials*, **2018**, 1, 2991, <http://dx.doi.org/10.1021/acsaem.8b00387>
1. J.-k Pi, G.-p. Wu, H.-c Yang, C.G. Arges<sup>a</sup>, Z.-k Xu, Separators with biomineralized zirconia coatings for enhanced thermo- and electro-performance of lithium ion batteries, *ACS Applied Materials & Interfaces*, **2017**, 9, 21971, <http://dx.doi.org/10.1021/acsaem.7b04505>

## PATENTS

2. V.M. Palakkal, M.L. Jordan, C.G. Arges, Resin Wafer Technologies with Solution Processable Ionomers, U.S. Patent Application # 62/971,141, **2020**.
1. C.G. Arges, J.C. Flake, and Y. Fang, Electrochemical reactor for upgrading methane and small alkanes to longer alkanes and alkenes, U.S. Patent Application # 62/656,538, **2018**.

## FUNDING

Total: \$4.32M; My share: \$1.13M (does not include cost share)

Lead PI on Awards from the National Science Foundation, U.S. Department of Energy Office of Science Basic Energy Sciences, and U. S. Department of Energy Office of Energy Efficiency Renewable Energy Advanced Manufacturing Office, and Louisiana Board of Regents.

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## USER OF NATIONAL LAB FACILITIES

2. Advanced Photon Source, Argonne National Laboratory, 2BM, X-Ray Tomography
1. Advanced Photon Source, Argonne National Laboratory, 8-ID-E, Grazing-Incidence Small Angle X-ray Scattering

## SUPERVISED STUDENTS

### *Graduate students (current)*

4. Deepra Bhattacharya - PhD student *Dec. 2018 - current*
3. Matthew Jordan - PhD student (NSF GFRP and US DOE SCGSR) *Nov 2018 - current*
2. Gokul Venugopalan - PhD candidate (passed General Exam in 2019) *Jan 2018 - current*
1. Subarna Kole - PhD candidate (passed General Exam in 2020) *Nov 2017 - current*

### *Graduate students (alumni)*

3. Varada Menon Palakkal - PhD Degree *Jan 2016 – May 2020*
2. Qi Lei – M.S. Degree (Thesis) *Jan 2018 – May 2020*
1. Le Zhang – M.S. Degree (Thesis) *Jan 2016 – Aug 2018*

### *Undergraduate and high school students*

27 different students

## AWARDS

- Emerging Young Investigator Award, Journal of Materials Chemistry A *2020*
- LSU Alumni Association Rising Faculty Research Award *Apr 2019*
- Tiger Athletic Foundation Undergraduate Teaching Award *Apr 2019*
- 3M Non-Tenured Faculty Award *Feb 2018*

## INVITED TALKS

### *Most recent invited talks*

10. C.G. Arges, Electrochemistry at the macromolecular level with block copolymers, *University of North Texas – Department of Materials Science and Engineering, 2020*
9. V.M. Palakkal<sup>b</sup>, L. Valentino, Q. Lei<sup>b</sup>, M.L. Jordan<sup>b</sup>, C.G. Arges, Speeding up Electrochemical Separations with Energy Impunity Using Ionomer Binder Resin-Wafers, *AIChE National Meeting, 2019*
8. C.G. Arges, Molecular Engineering of Polymer Electrolytes for Electrochemical Processes, *Case Western University – Department of Chemical and Biomolecular Engineering, 2019*
7. C.G. Arges, Qi Lei, Ke Li, and Revati Kumar, Differences in the extent of counterion condensation of ordered block copolymer electrolytes (BCEs) versus random copolymer electrolytes (RCEs), *U.S. Department of Energy, Basic Energy Sciences, Separation Science PI Meeting, 2019*
6. C.G. Arges and G. Venugopalan, (Invited) Stable and Conductive Anhydrous Proton Conducting Membranes Based on Polycations Blended with Polybenzimidazole, *235<sup>th</sup> ECS Meeting, 2019*
5. C.G. Arges, Directed self-assembly and new avenues of research for ionomer materials, *ACS Polymer Division: Polymers for fuel cells, energy storage, and conversion, 2019*
4. C.G. Arges, Counterion condensation and new porous ionic materials for electrochemical separations, *Tulane University – Department of Chemical & Biomolecular Engineering, 2019*
3. C.G. Arges, Counterion condensation and porous ionic materials for electrochemical separations, *University of Arkansas Fayetteville – Ralph E. Martin Department of Chemical Engineering, 2019*

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2. C.G. Arges, (Invited) Molecular engineering of polymers for electrochemical energy conversion and separation, *AIChE National Meeting*, **2018**
1. C.G. Arges, Harnessing molecular control of polymers using directed self-assembly principles for next generation water and energy materials, *University of Nebraska Lincoln – Department of Chemical and Biological Engineering*, **2018**

## SERVICE

### Louisiana State University service

- Electrochemical Society Student Chapter at LSU – Faculty Advisor – 2016 – current
- Undergraduate Committee for the Cain Department of Chemical Engineering – 2016 – current
- Dissertation or Master Committee Member for Benjamin Peterson (PhD) – 2018 – current, Yuxin Fang (PhD) – 2016 – 2018, Evan Andrews (PhD) – 2017, Haihui Zhu (MS) – 2019, Elizabeth Whiddon (MS) – 2019, Yingzhen Ma (PhD) – 2019 – current
- Dean’s Representative for PhD dissertation thesis defenses (n=4)
- Elected Chair of the Scientific Advisory Committee for CAMD – 2017 – 2020
- Faculty Search Committee Member – 2017-2018 and 2019-2020
- College of Engineering College Policy Committee (CPC) – 2018 – current
- Committee Member for Shared Laboratory for Macro- and Bio-macromolecule Research (SLMBR) Steering Committee, 2019 – Present

### Outside professional service

#### *Peer review*

- NSF Panelist/Proposal Reviewer; U.S. Department of Energy Proposal Reviewer; Stanford Synchrotron Radiation Lightsource (SSRL) Proposal Reviewer; ACS Petroleum Research Fund Proposal Reviewer; American Association for the Advancement of Science (AAAS)
- Referee for 49 different journals (selected list): Energy & Environmental Science; Journal of the American Chemical Society; Accounts of Chemical Research; Angewandte Chemie; Science Advances, Nature Communications; Chemistry of Materials; ACS Macro Letters; ACS Materials Letters; ACS Applied Materials & Interfaces; Environmental Science & Technology Letters; ACS Sustainable Chemistry & Engineering; Macromolecules; Progress in Polymer Science; ACS Applied Energy Materials; Applied Catalysis B: Environmental; Journal of Membrane Science; Journal of the Electrochemical Society; Polymer Chemistry; Journal of Materials Chemistry A;
- Guest Editor for *Journal of Power Sources* – Issue on Alkaline Membrane Fuel Cells, **2018**, 375, 29 contributions from global leaders
- Guest Editor for *ECS Interface* – Next Generation Electrolytes for Electrochemical Devices, **Spring 2017**, 4 contributions
- ECS Awards Committee, 2019 - Present

#### *Outreach activities*

- North Banks Middle School (Baton Rouge) and East Baton Rouge Magnet High School
- Mentored five high school students in laboratory research from Baton Rouge Magnet High School and Saint Joseph’s Academy High School
- ENGage LSU Day – Developed interactive activities entitled: ‘The indestructible IV bag: the importance of plasticizers in polymers’ in 2017 and “Wonderful World of Polymers for Clean Energy and Water” in 2018. Over 100 middle school students participated each year.

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## *Chair or Organizer for technical sessions (last 3 years)*

- Lead organizer and Chair for Electrochemical Fundamentals 01E, Emerging Topics in Electrochemical Engineering: Electrochemical Separations (invited talks) – Oral Session, *AICHE Meeting, Nov 2020*
- Co-organizer and co-chair for Electrochemical Fundamentals 01E, Tutorial Session on Electrochemical Methods, Systems and Applications (Invited Talks) – Oral Session, *AICHE Meeting, Nov 2020*
- Co-organizer and co-chair for Polymers 08A, Charged and Ion-Containing Polymers – Oral Session, *AICHE Meeting, Nov 2020*
- Co-organizer and co-chair for Electrochemical Membranes: Applications, *North American Membrane Society (NAMS), May 2020*
- Co-organizer and co-chair for Electrochemical Fundamentals 01E, Emerging Applications in Electrochemical Separations (Invited) – Oral Session, *AICHE Meeting, Nov 2019*
- Chair for Session on Structure & Dynamics of Electrolytes: From the Bulk to Interfaces, *ACS National Spring Meeting, Apr 2019*
- Co-organizer and co-chair for Focus Session on Block Copolymer Thin Films, *APS March Meeting, Mar 2019*

## **TEACHING**

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### Louisiana State University

- ChE 4198 S2020: Process Dynamics and Control, Core Course, Senior Level, 57 students (co-instructor, 20% credit)
- ChE 4162 S2019/F2019/S2020: Unit Operations Laboratory, Core Course, Senior Level, 28 students, 49 students, 28 students (co-instructor, my sections)
- ChE 4275/7700 F2017/F2018/S2020: Electrochemical Engineering, Tech Elective; 18 students, 32 students, 19 students
- ChE 3104 F2017/F2018: Engineering Measurements Laboratory, Core Course, Junior/Senior Level, 16 students, 17 students (co-instructor, my sections)
- ChE 4221/4222/3900/3910/3911 F2016/S2017/F2017/S2018/F2019/S2020: Undergraduate Research, Tech Elective; 7 students total
- ChE 3102 S2016/S2017/S2018: Heat and Mass Transfer; Core Course, Junior Level; 162 students, 151 students, 147 students

## **CONSULTING**

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- Kairos Ventures 2017

## **PROFESSIONAL AFFILIATIONS**

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- Member of the American Chemical Society (ACS)
- Member of the American Institute of Chemical Engineers (AIChE)
- Member of the Electrochemical Society (ECS)
- Member of the American Physical Society (APS)
- Member of the International Society for Optics and Photonics (SPIE)
- Member of the North American Membrane Society (NAMS)