

## SUMMARY

- Developed an atomic force microscopy protocol that helped quantify interactions between a single bacterium and different substrates in a liquid environment in order to assess bioadhesion
- Trained and assisted a postdoc and graduate students to apply the protocol and use other lab equipment resulting in 2 coauthored papers
- Characterized surfaces of polymer membranes using different techniques and tested their performance
- Presented research to environmental engineering and membrane technology audience in addition to natural organic matter experts in 2 national conferences and 1 international conference

## SKILLS

**Techniques:** Atomic force microscopy (Single-cell force spectroscopy, colloidal probe technique, and imaging), UV/vis spectroscopy, Raman spectroscopy, FTIR, goniometry, surface charge measurements, XPS, SEM.

**Data Analysis:** Origin, Excel, Matlab.

## EDUCATION

<b>Doctor of Philosophy, Civil Engineering</b> (Environmental emphasis)	<b>Expected July 2020</b>
University of Minnesota – Twin Cities, Department of Civil, Environmental, and Geo-Engineering	GPA 3.57
<b>Master of Science, Environmental Technology</b>	<b>May 2013</b>
American University of Beirut-Lebanon, Department of Civil and Environmental Engineering	GPA 4.00
<b>Teaching Diploma in Teaching of Sciences</b>	<b>June 2006</b>
<b>Bachelor of Science in Physics</b>	<b>June 2005</b>
<b>Minor in Mathematics</b>	
American University of Beirut-Lebanon, Departments of Education, Physics, and Mathematics	GPA 3.93

## RELATED EXPERIENCE

**Graduate Research Assistant** **September 2015-**  
**Present**

**Department of Civil, Environmental, Geo-engineering, University of Minnesota – Minneapolis, MN**

- Fabricate and modify polysulfone (PS) ultrafiltration (UF) membranes using different functionalization methods to change their surface properties
- Analyze surface properties (roughness, contact angle, zeta potential, Raman mapping, and FTIR) of UF and reverse osmosis (RO) membranes as well as other surfaces using different laboratory instruments
- Assess the performance and fouling behavior of RO membranes
- Perform filtration and separation tests of UF membranes using different foulants after setting experimental plans
- Functionalize surfaces with graphene oxide using Langmuir-Blodgett trough
- Develop an atomic force microscopy (AFM) protocol to study biofouling of polymeric membranes and other surfaces at single cell level (single cell-force spectroscopy) and perform corresponding experiments
- Develop protocols to functionalize AFM probes with gold nanoparticles to study the interaction forces between bacteria and gold nanoparticles
- Train and assist undergraduate and graduate students on using different laboratory instrumentation and following set testing procedures
- Collect and analyze experimental data to be included in presentations, posters and peer-reviewed journal manuscripts

**Graduate Research Assistant** **September 2009-August 2012**

**Department of Civil and Environmental Engineering, American University of Beirut- Beirut, Lebanon**

- Developed experimental setup and protocol for in situ measurements of the strength and concentration of flocs resulting from the treatment of highly turbid waters using liquid bittern
- Prepared liquid bittern from raw seawater and characterized its physicochemical properties
- Monitored water quality in the environmental engineering research center and assessed air quality stations

## TEACHING EXPERIENCE

**Teaching Assistant** September 2016–May 2017, September 2018–May 2019  
**Department of Civil, Environmental, and Geo-Engineering University of Minnesota – Minneapolis, MN**

- Corrected assignments, lab reports and tests in addition to updating material and grades on course webpage
- Held office hours and review sessions
- Taught part of class material and preparing answer keys
- Supervised lab sessions and preparing lab setups
- Courses: Environmental Engineering Lab; Environmental Issues and Solutions; Water and Wastewater Treatment

**Mathematics/Physics Teacher, Head of Middle and High School Science Department** September 2012–June 2015  
*Tarbiyah Islamiyah Schools (American Diploma Program)– Riyadh, KSA*

**High School Mathematics and Physics teacher** September 2009–June 2012  
*Al-Bayader School – Aramoun, Lebanon*

**Physics Teacher, Head of Middle and High School Science Departments** September 2006–June 2009  
*Global Academy International-Doha, Qatar*

**High School Physics Teacher** September 2005–June 2006  
*Beirut High School – Beirut, Lebanon*

The set of skills shaped while teaching in diverse international environment and that continue to develop during graduate studies include:

- Adapting to different environments and developing relationships while keeping clear communication skills (speaking and writing effectively as well as listening attentively).
- Managing group of coworkers to set and attain annual goals through coaching, providing resources and feedback, evaluating progress, and motivating
- Coordinating tasks (e.g. designing experimental plans, creating protocols, carrying out experiments, analyzing results, summarizing and reporting findings) and collaborating with others from different disciplines to complete projects

## PUBLICATIONS (\*First coauthor)

- 1) Wuolo-Journey\* K, Binahmed\* S, Linna E, Romero-Vargas Castrillón S. Do graphene oxide nanostructured coatings mitigate bacterial adhesion? *Environ Sci Nano*. 2019;6(9):2863–75.
- 2) BinAhmed, S., Hasane, A., Zhaoxing, W., Mansurov, A., Castrillón, S. R.-V. Bacterial Adhesion to Ultrafiltration Membranes: Role of Hydrophilicity, Natural Organic Matter, and Cell-Surface Macromolecules. *Environ. Sci. & Technol.* **52**(1), 162-172 (2018).
- 3) Xue\*, J.; BinAhmed\*, S.; Wang, Z.; Karp, N. G.; Stottrup, B. L.; Romero-Vargas Castrillón, S. Bacterial Adhesion to Graphene Oxide (GO)-Functionalized Interfaces Is Determined by Hydrophobicity and GO Sheet Spatial Orientation. *Environ. Sci. Technol. Lett.* **2018**, 5 (1), 14–19.
- 4) BinAhmed, S., Ayoub, G., Al-Hindi, M., Azizi, F. The effect of fast mixing conditions on the coagulation–flocculation process of highly turbid suspensions using liquid bittern coagulant. *Desalin. Water Treat.* **53**, 3388–3396 (2015).
- 5) Ayoub, G. M.; BinAhmed, S. W.; Al-Hindi, M.; Azizi, F. Coagulation of Highly Turbid Suspensions Using Magnesium Hydroxide: Effects of Slow Mixing Conditions. *Environ. Sci. Pollut. Res.* **2014**, 21 (17), 10502–10513.

## CONFERENCE PRESENTATIONS & POSTERS (\*Presenter)

### Presentations

- 1) BinAhmed\*, S., Romero-Vargas Castrillón, S., Hozalski, R. Effect of temperature and humic substances on initial bacterial adhesion to reverse osmosis membranes. 19<sup>th</sup> International Conference, September 16-21, 2018, Albena, Bulgaria.
- 2) BinAhmed\*, S., Hasane, A., Wang, Z., Romero-Vargas Castrillón, S. Quantifying bacterial adhesion to polymeric membranes by single-cell force spectroscopy. 253<sup>rd</sup> ACS National Meeting (Novel Membrane Materials & Processes for Water Purification Session), April 2-6, 2017, San Francisco, CA.
- 3) Xue\*, J.; BinAhmed, S.; Wang, Z.; Stottrup, B. L.; Romero-Vargas Castrillón, S. Initial Adhesion of Bacterial Cells on Surfaces Functionalized with Graphene Oxide: Insights from AFM-Based Single-Cell Force Spectroscopy. 2017 AIChE Annual Meeting ( Graphene 2-D Materials: Synthesis, Functions and Applications II Session), October 29 – November 3, 2017, Minneapolis, MN.
- 4) BinAhmed\*, S., Ayoub, G., Al-Hindi, M., Azizi, F. The effect of fast mixing conditions on the coagulation–flocculation process of highly turbid suspensions using liquid bittern coagulant. International Conference WIN4Life, September 19–21, 2013, Tinos Island, Greece.

### Posters

- 1) BinAhmed\*, S., Romero-Vargas Castrillón, S., Hozalski, R. Effect of temperature and humic substances on initial bacterial adhesion to reverse osmosis membranes. 19<sup>th</sup> International Conference, September 16-21, 2018, Albena, Bulgaria.
- 2) Xue, J., BinAhmed\*, S., Wang, Z., Karp, N., Stottrup, B. & Romero-Vargas Castrillón, S. The interactions of bacterial cells with model graphene oxide surfaces: insights from single-cell force spectroscopy. 3M Science and Engineering Faculty Day, June 6, 2017, Maplewood, MN.
- 3) BinAhmed\*, S., Hasane, A., Zhaoxing, W., Mansurov, A., Romero-Vargas Castrillón, S. Quantifying Bacterial Adhesion to Polymeric Membranes by Single-cell Force Spectroscopy.
  - a. AEESP Distinguished Lecture Series (poster session), March 31, 2017, Minneapolis, MN.
  - b. 2017 AIChE Annual Meeting (General Topics on Separations Session), October 31, 2017, Minneapolis, MN.
  - c. Gordon Research Seminar and Conference, Membranes: Materials & Processes, July 30-August 5, 2016, New London, NH.
  - d. 3M Science and Engineering Faculty Day, June 1, 2016, Maplewood, MN.

### Proceedings of Conferences

E. Linna, S. BinAhmed, B. L. Stottrup, S. Romero-Vargas Castrillón, Effect of Graphene Oxide Packing on Bacterial Adhesion using Single Cell Force Spectroscopy. *Biophys. J.* **114**, 352a–353a (2018).

### **AWARDS**

- 1) Doctoral Dissertation Fellowship for 2019-2020 academic year
- 2) International Humic Substances Society 2018 Travel Award for the 19<sup>th</sup> International Conference in Albena, Bulgaria (September 16-21, 2018)
- 3) Warren and Paula Weck Graduate Fellowship 2017-2018 academic year
- 4) Certificate of Merit. “Novel Membrane Materials & Processes for Water Purification” session, 253rd ACS National Meeting in San Francisco (April 6, 2017) & “Best Presentation” (initiative of Industrial & Engineering Chemistry Research Journal; ACS publication)
- 5) “Best Presentation” of the “Novel Membrane Materials & Processes for Water Purification” session at the 253rd ACS National Meeting in San Francisco (April 6, 2017): Initiative of Industrial & Engineering Chemistry Research (I&EC Research) journal (ACS Publication).
- 6) Ling Graduate Fellowship in Environmental Engineering for 2015-2016 academic year

### **PROFESSIONAL ORGANIZATIONS**

American Membrane Technology Association (AMTA)	2018- present
American Water Works Association (AWWA)	2018- 2019
International Humic Substances Society	2018- 2020

### **PUBLIC SERVICE**

Diversity and Equity committee member- Department of Civil and Environmental Engineering	Fall 2019- present
Council of Graduate Students (COGS) travel grant committee member	Spring 2019
Women in Science and Engineering Undergrad-Grad Mentor Program	Fall 2018
Student Conflict Resolution Center (SCRC) Dignity project work group member	Fall 2017- present
COGS representative to the SCRC Advisory Board	Fall 2017- Fall 2018