

Christa L. Brosseau**Professional Profile**

Christa L. Brosseau *B.Sc.H (Dalhousie), M.Sc (Acadia), Ph.D. (Guelph)*

Professor (Tenured)

Canada Research Chair (Tier 2) in Sustainable Chemistry and Materials

Department of Chemistry

Saint Mary's University

Halifax, NS, Canada

www.brosseaulab.com

Research Expertise

Interfacial electrochemistry and bioelectrochemistry

Plasmonics

Surface Vibrational Spectroscopy

Nanotechnology

Analytical and Biophysical Chemistry

Materials Chemistry

Professional Memberships

American Chemical Society (ACS)

Canadian Institute of Chemistry (CIC) – Analytical Chemistry Division Treasurer

International Society of Electrochemistry (ISE)

Electrochemical Society (ECS) – Past chairperson and current councilor

Bioelectrochemical Society (BES)

Academic Leaves:

June 2013 – June 2014 (Parental Leave)

September 2016 - September 2017 (Sabbatical Leave)

Published and Accepted Articles: Refereed Journals

**It should be noted that in the field of chemistry, the principal investigator on a publication is listed as the last author; the other authors are listed in order of their contribution to the work.

42. “Electrochemical Surface-Enhanced Raman Spectroscopy (EC-SERS) and Computational Study of Atrazine: Toward Point-of-Need Detection of Prevalent Hericides” N. Albarghouthi, M.M. Eisnor, C.C. Pye, C.L. Brosseau. *J. Phys. Chem. C.*, **2022**, 126(23), 9836-9842. ***Invited contribution for special issue of Nanophotonics for Chemical Imaging and Spectroscopy.***

41. “Electrochemical surface-enhanced Raman spectroscopy (EC-SERS): a tool for the identification of polyphenolic components in natural lake pigments. M.M. Eisnor, K.E.R.

McLeod, S. Bindesri, S.V. Svoboda, K.L. Wustholz, C.L. Brosseau. *Phys. Chem. Chem. Phys.* **2022**, 24(1), 347-356.

40. “Thiocloprid Detection by Silver Nanocubes based SERS Sensor” C. Puente, C.L. Brosseau, I. Lopez. *IEEE Transactions on NanoBioscience*, 2021, 21(1), 141-143.

39. “Fabrication of High-Quality Electrochemical SERS (EC-SERS) Substrates using Physical Vapour Deposition” C.G. Farling, M.C. Stackaruk, C.C. Pye, C.L. Brosseau. *Physical Chemistry Chemical Physics*, 2021, 23, 20065-20072. **COVER**

38. “Silver-chitosan and Gold-chitosan Substrates for Surface-Enhanced Raman Spectroscopy (SERS): Effect of Nanoparticle Morphology on SERS Performance. C. Peunte, M. Sanchez-Dominguez, C.L. Brosseau, I. Lopez. *Materials Chemistry and Physics*, **2021**, 260, 124107.

37. “Novel SERS-Active Materials and Substrates: Sensing and (Bio) applications. P. Piotrowski, M. Witkowski, C. Brosseau, Y. Ozaki, A. Królikowska. *Frontiers in Chemistry* **2021**, 9, 784735. (Editorial, Guest Editor invitation)

36. “Optimization of Gold Nanorod Arrays for Surface-Enhanced Raman Spectroscopy (SERS) Detection of Atrazine” N. Albarghouthi, P. MacMillan, C.L. Brosseau, *Analyst*, **2021**, 146(6), 2037-2047.

35. “Spectroelectrochemical and Computational Studies of Tetrahydrocannabinol (THC) and carboxy-Tetrahydrocannabinol (THC-COOH)” S. D. Bindesri, R. Jebailey, N. Albarghouthi, C.C. Pye, C.L. Brosseau, *Analyst*, **2020**, 145(5), 1849-1857.

Invited Contribution for Themed Issue on Analytical Nanoscience

34. “On the Origin of Electrochemical Surface-enhanced Raman Spectroscopy (EC-SERS) Signals for Bacterial samples: The Importance of Filtered Control Studies in the Development of New Bacterial Screening Platforms” K.E.R. McLeod, T. P. Lynk, C.S. Sit, C.L. Brosseau, *Analytical Methods*, **2019**, 11, 924-929.

33. “Electrochemical Surface-Enhanced Raman Spectroscopy as a Platform for Bacterial Detection and Identification” T.P. Lynk, C.S. Sit, C.L. Brosseau. *Analytical Chemistry*, **2018**, 90(21), 12639-12646.

32. “Development of an electrochemical surface-enhanced Raman spectroscopy (EC-SERS) fabric-based plasmonic sensor for point-of-care diagnostics” S.D. Bindesri, D.S. Alhatab, C.L. Brosseau. *Analyst*, **2018**, 143(17), p. 4128.

31. “Development of a sustainable plasmon-enhanced spectroelectrochemical sensor using avocado pit (*Persea Americana*) extract” T.P. Lynk, O.J.R. Clarke, N. Kesavan, C.L. Brosseau. *Sensors and Actuators B: Chemical*, **2018**, 257, p. 270.

30. “Electrochemical surface-enhanced Raman spectroscopy (EC-SERS) study of the interaction between protein aggregates and biomimetic membranes” R.A. Karaballi, S.

Merchant, S.R. Power, C.L. Brosseau. *Physical Chemistry Chemical Physics*, **2018**, 20, p. 4513.

29. "Electrochemical-Surface Enhanced Raman Spectroscopic (EC-SERS) Study of 6-Thiouric Acid: A Metabolite of the Chemotherapy Drug Azathioprine" B.H.C. Greene, D.S. Alhatab, C.C.Pye, C.L. Brosseau. *Journal of Physical Chemistry C*, **2017**, 121(14) p.8084.

28. "Evaluation of an Electrodeposited Bimetallic Cu/Ag Nanostructured Screen Printed Electrode for Electrochemical Surface-Enhanced Raman Spectroscopy (EC-SERS) Investigations" O.J.R. Clarke, G.J.H. St. Marie, C.L. Brosseau. *Journal of the Electrochemical Society*, **2017**, 164(5), p.B3091. **Invited contribution for focus issue: Biosensors and Micro-Nano Fabricated Electromechanical Systems.**

27. "Development of a SERS-Based Rapid Vertical Flow Assay for Point-of-Care Diagnostics" O.J.R. Clarke, B.L. Goodall, H.P. Hui, N. Vats, C.L. Brosseau. *Analytical Chemistry*, **2017**, 89(3), p.1405.

26. "Development of an Electrochemical Surface-Enhanced Raman Spectroscopy (EC-SERS) Aptasensor for Direct Detection of DNA Hybridization" R. Karaballi, A. Nel, S. Krishnan, J. Blackburn, C.L. Brosseau. *Physical Chemistry Chemical Physics*, **2015**, 2015, 17, p.21356. **Invited contribution for special issue on Surface-Enhanced Spectroscopies.**

25. "Quantitative Detection of Uric Acid by Electrochemical-Surface Enhanced Raman Spectroscopy (EC-SERS) Using a Multilayered Au/Ag Substrate" L. Zhao, J. Blackburn, C.L. Brosseau. *Analytical Chemistry*, **2015**, 87(1), p.441. **Featured in C&E News online: <http://cen.acs.org/articles/92/web/2014/12/SERS-Method-Offers-Earlier-Screening.html>**

24. "The development of "Fab-Chips" as low-cost, sensitive surface-enhanced Raman spectroscopy (SERS) substrates for prospective disease diagnosis" A. M. Robinson, L. Zhao, M. Yasmin, P. Bhandari, S.G. Harroun, D. Dendukuri, J. Blackburn, C.L. Brosseau: *Analyst*, **2015**, 140(3), p.779. **Featured in ACCN News, 2015.**

23. "A Simple Complex on the Verge of Breakdown: Isolation of the Elusive Cyanofolate Ion." L.J. Murphy, K.N. Robertson, S.G. Harroun, C.L. Brosseau, U. Werner-Zwanziger, J. Moilanen, H.M. Tuononen, J.A. Clyburne. *Science*, **2014**, 344(6179), p.75

22. "Electrochemical Surface-Enhanced Raman Spectroscopy (E-SERS) of Novel Biodegradable Ionic Liquids" S.G Harroun, T.J. Abraham, C. Prudhoe, Y. Zhang, P.J. Scammells, C.L. Brosseau, C.C. Pye, R.D. Singer. *Phys. Chem. Chem. Phys.*, **2013**, 15(44), p.19205

21. "Electrochemical SERS Study of a Biomimetic Membrane Supported at a Nanocavity Patterned Ag Electrode" M. Vezvaie, C.L. Brosseau, J. Lipkowski. *Electrochimica Acta*, **2013**, 110, p.120.

20. "Electrochemical and PM-IRRAS Characterization of Cholera Toxin Binding at a Model Biological Membrane" J. J. Leitch, C.L. Brosseau, S.G. Roscoe, K. Bessonov, J.R. Dutcher, J. Lipkowski, *Langmuir*, **2013**, 29, 965.
19. "Electrochemical-Surface Enhanced Raman Spectroscopy (E-SERS) of uric acid: A Potential Rapid Diagnostic Method for Early Preeclampsia Detection" B.L. Goodall, A.M. Robinson, C.L. Brosseau, *Physical Chemistry Chemical Physics*, **2013**, 15, p.1382.
18. "Use of Surface Enhanced Raman Spectroscopy for Studying Fouling on Nanofiltration Membrane" R. Lamsal, S.G. Harroun, C.L. Brosseau, G.A. Gagnon, *Separation and Purification Technology*, **2012**, 96, p.7.
17. "A Portable Electrochemical SERS system for Routine Spectroelectrochemical Analysis" A. Robinson, S. Harroun, J. Bergman, C.L. Brosseau. *Analytical Chemistry*, **2012**, 84, p.1760.
16. "Surface-Enhanced Raman Spectroscopy of House Paint and Wallpaper Samples from an 18th Century Historic Property". S.G. Harroun, J. Bergman, E. Jablonski, C.L. Brosseau, *Analyst*, **2011**, 136 (17), p. 3453. **Invited contribution for special issue featuring "Emerging Investigators"**
15. "Revealing the Invisible – Using Surface-enhanced Raman Spectroscopy to Identify Minute Remnants of Color in Winslow Homer's Colorless Skies." C. L Brosseau, F. Casadio, V.P. Van Duyne, *Journal of Raman Spectroscopy*, **2011**, 42(6), p. 1305.
14. "Surface-enhanced Raman spectroscopy of β -Thioglucose adsorbed on Nanostructured silver electrodes" M. Vezvaie, C.L. Brosseau, J.D. Goddard, J. Lipkowski, *Chemphyschem*, **2010**, 11(7) p. 1460.
13. "Surface-enhanced Raman spectroscopy of dyes: from single molecules to the artists' canvas." K. L. Wustholz, C.L. Brosseau, F. Casadio, R.P Van Duyne. *Physical Chemistry Chemical Physics*, **2009**, 11(34), p. 7350.
12. "Surface-Enhanced Raman Spectroscopy: A Direct Method to Identify Colorants in Various Artist Media" C.L. Brosseau, K. Rayner, F. Casadio, C.M Grzywacz, R.P Van Duyne. *Analytical Chemistry*, **2009**, 81(17) p.7443.
11. "Ad-Hoc SERS Methodologies for the Detection of Artist Dyestuffs: Thin Layer Chromatography – Surface-Enhanced Raman Spectroscopy (TLC-SERS) and In Situ *On the Fiber Analysis*" C.L. Brosseau, A. Gambardella, F. Casadio, C.M. Grzywacz, J. Wouters, R.P. Van Duyne. *Analytical Chemistry*, **2009**, 81(8), p. 3056.
10. "AFM Studies of the Effect of Temperature and Electric Field on the Structure of a DMPC-Cholesterol Bilayer Supported on a Au(111) Electrode Surface" M. Chen, M. Li, C.L. Brosseau, J. Lipkowski, *Langmuir*, **2009**, 25(2), 1028.
9. "Electrochemical and PM-IRRAS Studies of a Glycolipid Containing Biomimetic Membrane Prepared using Langmuir Blodgett / Langmuir Schaefer Deposition" C.L.

Brosseau, J. Leitch, X. Bin, M. Chen, S.G. Roscoe, J. Lipkowski, *Langmuir*, **2008**, 24(22), p. 13058.

8. "AFM Studies of Solid-Supported Lipid Bilayers formed at a Au(111) Electrode Surface Using Vesicle Fusion and a Combination of Langmuir-Blodgett and Langmuir-Schaefer Techniques" M. Li, M. Chen, E. Sheepwash, C. L. Brosseau, H-Q Li, B. Pettinger, H. Gruler, J. Lipkowski, *Langmuir*, **2008**, 24(18), p. 10313.

7. "In Situ STM Study of Field Driven Transitions in the Film of a Cationic Surfactant Adsorbed on a Au(111) Electrode Surface" S. Sek, C.L. Brosseau, M. Chen, J. Lipkowski, *Langmuir* (COVER), **2007**, 23, p.12529.

6. "Electrochemical and PM-IRRAS Characterization of DMPC/Cholesterol Bilayers Prepared Using Langmuir-Blodgett / Langmuir-Schaefer Deposition" C.L. Brosseau, X. Bin, S.G. Roscoe, J. Lipkowski, *Journal of Electroanalytical Chemistry*, **2008**, 621, p. 222.

5. "Adsorption of N-Decyl-N,N,N-Trimethyl Ammonium Triflate (DeTATf), A Model Cationic Surfactant, on the Au(111) Surface" C.L. Brosseau, E. Sheepwash, I. Burgess, E. Cholewa, J. Lipkowski, S.G. Roscoe, *Langmuir*, **2007**, 23, p. 1784.

4. "Layer by layer Characterization of DMPC Bilayers Deposited on a Au(111) Electrode Surface by PM-IRRAS" N. Garcia-Araez, C.L. Brosseau, P. Rodriguez, J. Lipkowski. *Langmuir*, **2006**, 22(25), p. 10365.

3. "Electrochemical Quartz Crystal Nanobalance and Chronocoulometry Studies of Phenylalanine Adsorption on Au" C.L. Brosseau and S.G. Roscoe, *Electrochimica Acta*, **2006**, 51(11), p. 2145

2. "Electrochemical Quartz Crystal Nanobalance (EQCN) Studies of the Adsorption Behaviour of an Enzyme, Mandelate Racemase, and its Substrate, Mandelic acid on Pt" C.L. Brosseau and S.G. Roscoe, *Electrochimica Acta*, **2005**, 50(6), p. 1289.

1. "L-Phenylalanine Adsorption on Pt: Electrochemical Impedance Spectroscopy and Quartz Crystal Nanobalance Studies" J.E.I Wright, K. Fatih, C.L. Brosseau, S. Omanovic, and S.G. Roscoe, *Journal of Electroanalytical Chemistry*, **2003**, 550, p. 41

Peer-reviewed Book chapters, Books, and Edited Collections and Critical editions:

"PM-IRRAS Studies of a Biomimetic membrane supported at a gold electrode surface"; A.H. Kycia, Z. Su, C.L. Brosseau, J. Lipkowski in "Vibrational Spectroscopy at Electrified Interfaces". John Wiley Publications, Hoboken, New Jersey, ed. A. Wieckowski. Wiley Series on Electrocatalysis and Electrochemistry. Chapter 11: "In-situ PM-IRRAS Studies of Biomimetic Membranes Supported at Gold Electrode Surfaces" A.H. Kycia, Z. Su, C.L. Brosseau, J. Lipkowski. p.345

Patents:

US 9518986 B2 - Method of detecting and/or quantifying an analyte in a biological sample

Filing Date: November 2, 2012

Publication Date: December 13, 2016

National phase filing launched in May 2014 in six countries: South Africa, China, Brazil, USA, Europe, India.

Intellectual contribution = 10%

Presentations: Refereed (Past 3 Years)

“Novel Copper Physical Vapour Deposition Substrates for Routine Electrochemical Surface-Enhanced Raman Spectroscopy. C.L. Brosseau, Mary Stackaruk. CCCE 2022, June 13-17. **Invited lecture.**

“Development of a Fabric-based Wearable Plasmonic Sensor for Early Detection of Post-Traumatic Stress Disorder. C.L. Brosseau, Jaskaran Anand, Mal Hedrick, Li-Lin Tay. CCCE 2022, June 13-17. **Invited lecture.**

“Development of an Electrochemical SERS Aptasensor for Detection of Cardiac Troponin I – Challenges and Opportunities” C.L. Brosseau, S. Julien. CCCE 2022, June 13-17. **Invited lecture.**

“Into Another Dimension – Coupling 2D-LC and SERS for Chemical Analysis” C.L. Brosseau, Maddison Eisnor, Kristin Wustholz. Pacifichem 2021, December 17, 2021. **Invited lecture.**

“Electrochemical SERS for Point-of-Need Detection of Cannabinoids” C.L. Brosseau, S. Bindsri, N. Albarghouthi, C.C. Pye. Pacifichem 2021, December 20, 2021. **Invited lecture.**

“Physical Vapour Deposition (PVD) – A Facile Route for the Production of High Performance Screen Printed Electrodes for Electrochemical SERS Investigations” C.L. Brosseau, C.G. Farling, M.C. Stackaruk, C.C. Pye. IUPAC / CCCE 2021 Virtual Conference, August 13-21, 2021.

“Going Green with Silver – Development of Sustainable Plasmonic Sensors” – C.L. Brosseau, O. Clarke, G. St. Marie. SciX 2019, Palm Springs, California, USA. **Invited lecture.**

“Electrochemical SERS for Bacterial Detection” – C.L. Brosseau, K.L. McLeod, T.P. Lynk, C.Sit. SciX 2019, Palm Springs, California, USA. **Invited lecture.**

“Plasmonics at the Electrified Interface – Advances and Applications in EC-SERS” C.L. Brosseau, S. Bindsri, T.P. Lynk, K. McLeod. 9th International Conference on Enhanced Spectroscopies. Jun 17-20, 2019, London, Ontario. **Invited lecture.**

“Electrochemical SERS – Advances and Applications in Bioanalytical Chemistry” C.L. Brosseau, R. Karaballi, S. Merchant, S. Power. 102nd Canadian Chemistry Conference and Exhibition. June 3-7, 2019, Quebec City, Quebec.

“Electrochemical SERS – A Tool for Bacterial Detection and Identification” C.L. Brosseau, T.P. Lynk, K. McLeod, C.S. Sit. 102nd Canadian Chemistry Conference and Exhibition. June 3-7, 2019, Quebec City, Quebec. **Invited lecture.**

“Spectroelectrochemical and Computational Studies of Tetrahydrocannabinol – Towards a Point-of-Need Sensor” C.L. Brosseau, C.C. Pye, S. Bindsri, R. Jebailey, N. Albarghouthi. 102nd Canadian Chemistry Conference and Exhibition. June 3-7, 2019, Quebec City, Quebec. **Invited lecture.**

Presentations: Non-refereed (Past 3 Years)

“Adventures in Plasmonics: From Sensing to Sustainability”, Universite de Montreal, January 20, 2021. **Invited lecture**

“Adventures in Plasmonics: From Sensing to Sustainability”, NRC-NANO, July 30, 2020. **Invited lecture**

Media Mentions (Past 3 years)

Research was highlighted in the following press articles:

- Participated in the SMU “Meet our Researchers” highlights
<http://www.smu.ca/research/dr-christa-brosseau.html>

During COVID-19, we pivoted our research to begin work on biomass conversion for medical pulp:

<https://atlantic.ctvnews.ca/nova-scotia-chemists-team-up-with-mill-to-make-n95-masks-using-pulp-1.4938086>

<https://www.canadianmanufacturing.com/features/pulp-paper-canada-transforming-pulp-can-tmp-act-like-kraft-pulp-for-use-in-n95-masks/>

<https://www.pulpandpapercanada.com/researchers-study-if-nova-scotia-pulp-can-be-used-for-n95-mask-production/>

<https://www.pulpandpapercanada.com/medical-grade-pulp-production-viable-in-nova-scotia-says-study/>

<https://news.smu.ca/news/2021/6/8/saint-marys-study-suggests-a-future-for-medical-grade-pulp-production-in-nova-scotia>

<https://news.smu.ca/news/2021/3/5/smu-receives-federal-funding-for-major-new-chemistry-centre-collaboration>

Major Research Grants Held Currently

NSERC Discovery Grant (2016-2021) **\$36,000.00 per annum**
(Novel Plasmonic Architectures for Advanced Molecular Sensing)

Canada Research Chair in Sustainable Chemistry and Materials (2016-2021)
\$100,000.00 per annum

CFI – 2020 Innovation Fund (Co-Applicant with Memorial University)
\$1.2 M (Total Funding)

NRC New Beginnings Fund **\$25,000.00**
(Fabric-based plasmonic sensor for PTSD detection)

Nova Scotia Mineral Resources Development Fund (MRDF) **\$100,000.00**
(Sustainable Gold Recovery from low-grade ore - Awarded June 2022)

Major Research Grants Recently Completed (previous 3 years)

Nova Scotia Mineral Resources Development Fund (2020-2021)
(Innovation Grant) **\$100,000.00**

Research NS (COVID-19) **\$72,500.00**

NS Innovation Voucher **\$25,000.00 (2019-2020)**

Nova Scotia Mineral Resources Development Fund **(2019-2020)**
(Innovation Grant) **\$105,000.00**

NSBI Innovation Voucher **\$15,000.00 (October 2018 – February 2019)**

Teaching Experience

Courses Taught:

CHEM 4452 - Biochemistry: Metabolism

CHEM 2332 – Introductory Analytical Chemistry: Wet Methods + Laboratory

CHEM 2333 – Introductory Analytical Chemistry: Instrumentation + Laboratory

CHEM 1211 – General Chemistry for Physical Sciences

CHEM 3451 – Biochemistry: Laboratory component

FRSC 2200 / 3300 – Forensic Chemistry, Forensic Toxicology

Directed Studies / Special Topics Courses**: Advanced Topics in Spectroscopy, Sustainable Chemistry, Nanomaterials, Surface Chemistry and Electrochemistry, Biophysical Chemistry

Awards and other Honors Received:

SMU President's Award for Excellence in Research (2019)

Anderson Award for Excellence in Teaching and Research (Memorial University) (May 2018)

Canada Research Chair – Sustainable Chemistry and Materials (December 2016, renewed for second term in 2021)

Discovery Award – Emerging Professional, 2013 Discovery Awards, Halifax NS, November 2013

SMUSA Faculty of Science Teaching Excellence Award (Winter 2010)