

Exponent®
Engineering & Scientific Consulting

Lucy Buannic, Ph.D.

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Professional Profile

Dr. Lucienne (Lucy) Buannic is a solid-state chemist with expertise in rechargeable batteries. She has over seven years of solid-state battery experience, including product development. Her research interests range from electrolyte materials and their processing to the industrial manufacturing of 40 Ah cells.

Dr. Buannic is also well versed in materials characterization, rechargeable battery design, and performance assessment. She has explored chemistries spanning from lithium ion, sodium ion, lead acid, to emerging water-based systems.

Dr. Buannic has extensive experience in evaluating electrochemical systems, inorganic materials, and batteries using electrochemical impedance spectroscopy (EIS) and galvanostatic cycling. She has performed failure analyses and quality assessments using scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDS) and computed tomography (CT) X-ray scanning on batteries ranging in application from consumer electronics to power tools. Dr. Buannic is knowledgeable in thermal analysis including thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC), and accelerating rate calorimetry (ARC). She is also experienced in X-ray diffraction (XRD), gas-chromatography coupled to a thermal conductivity detector (GC-TCD), and inductively coupled plasma (ICP) analyses.

Prior to joining Exponent, Dr. Buannic was investigating a new aqueous-based rechargeable battery technology as a Senior Scientist at Everon24. She contributed to the development of an aqueous battery chemistry by identifying electrochemical metal oxide deposition and unwanted side-reactions such as anion reduction and hydrogen evolution reaction. Dr. Buannic also held tenure as a Senior Research Scientist at A123 Systems, scaling up a lithium-based solid-state battery technology, overseeing the electrode mixing and coating, cell assembly, testing, and evaluating cells for safety. Her prior academic appointments include Associate Researcher at the CIC Energigune (Spain), visiting scholar at the California Institute of Technology (Caltech), and post-doctoral researcher at the Center of Atomic and Alternative Energies (CEA, France). During this time, she synthesized, characterized, and optimized lithium ion conducting solid electrolytes such as the garnet Li7La3Zr2O12 and PEO-based composites of the former. She evaluated ceramic processing techniques including freeze casting and thermoreversible gel casting as potential routes for the industrial development of garnet based solid-state batteries. She investigated sodium based solid-state batteries and the failure mechanisms of lead acid batteries. Dr. Buannic's graduate research was focused on the characterization of proton and oxygen conducting solid oxide fuel cell (SOFC) electrolytes, $BaZrO_3$ and $BaSnO_3$, using solid state nuclear magnetic resonance (ssNMR) at SUNY Stony Brook with Professor Clare Grey.

Academic Credentials & Professional Honors

Ph.D., Chemistry, Stony Brook University, 2011

M.Sc., Chemistry, Ecole Superieure de Chimie Organique (ESCOM), 2007

M.S., Chemistry, University of Neuville Cergy-Pontoise, France, 2005

B.S., Chemistry, University of Neuville Cergy-Pontoise, France, 2004

Licenses and Certifications

Certified Fire and Explosion Investigator (CFEI)

Prior Experience

Senior Research Scientist, EverOn24, 2021-2022

Senior Research Scientist, A123 Systems, 2018-2020

Associate Researcher, CIC Energigune, 2014-2018

Post-Doctoral Researcher, CEA Grenoble, 2011-2013

Languages

French (France)

Spanish

Patents

Hoffert Wesley, Rojas Adriana, Laughman David, Buannic Lucienne, Johnson Derek, Sisk Brian, Chiou Brian, Gillooly Thomas. “Systems and methods for a composite solid-state battery cell with an ionically conductove polymer electorlyte Part A”. US-provisional 62/869,405 (Filed July 2019)

Hoffert Wesley, Rojas Adriana, Laughman David, Buannic Lucienne, Johnson Derek, Sisk Brian. “Systems and methods for a composite solid-state battery cell with an ionically conductove polymer electorlyte Part B”. US-16/918,763 (Filed July 2019)

Otaegui Ameztegui Laida, Villaverde Orejon Aitor, Quintela Zumeta Amaia, Morant Minana Maria Carmen, Buannic Lucienne. “Solid-state sodium battery.” EP19382651.8 (Filed July 2019)

Buannic Lucienne, Chakir Mohamed, and López-Aranguren Pedro. “Method for forming a Li-ion battery cell.” FR3095552 (Filed June 2018)

Armand Michel, Rojo Teofilo, Singh Gurpreet, Otaegui Ameztegui Laida, Aguesse Frédéric, Buannic Lucienne. “A sodium ceramic electrolyte battery”. EP 14382393.8 (Filed October 2015)

Buannic Lucienne, Colin Jean-François, Rey Marleyne. “Mixed titanium niobium oxide containing a trivalent metal”. EP 13 51023 (Filed February 2013)

Buannic Lucienne, Colin Jean-François, Daniel Lise. “Synthesis process for a mixed titanium niobium oxide via a solvothermal treatment; electrode and lithium accumulator containing this mixed oxide”. EP 12 59881 (Filed October 2012)

Publications

Buannic L. Reliability and failure trends in stationary battery fleets: lead-acid and lithium-ion systems. Battcon 2026.

López-Aranguren P, Judez X, Chakir M, Armand M, Buannic L. High Voltage Solid State Batteries: Targeting High Energy Density with Polymer Composite Electrolytes. J. Electrochem. Soc., 167, 020548 (2020)

Zagórski J, Lopez del Amo JM, Cordill M, Aguesse F, Buannic L, Llordés A. Garnet-polymer composite electrolytes: new insights on local Li-ion dynamics and electrodeposition stability with Li metal anodes. ACS Appl. Energy Mater., 2, 1734 - 1746 (2019)

Pitillas A, Aguesse F, Llordés A, Buannic L. The cathode, a key player in the success of Li metal solid state batteries. J. Phys. Chem. C, 123, 6, 3270 - 3278 (2019)

Manalastas W Jr., Rikarte J, Chater R J., Brugge R, Aguadero A, Buannic L, Llordés A, Aguesse F, Kilner J. Mechanical failure of garnet electrolytes during Li electrodeposition observed by in-operando microscopy. J. Power Sources, 412, 287 – 293 (2018)

Buannic L, Naviroj M, Miller SM, Zagorski J, Faber KT, Llordés A. Li7La3Zr2O12 garnet-polymer composite with a novel architecture providing a contiguous and oriented ceramic framework. J. Amer. Ceram. Soc., 102, 1021 – 1029 (2018)

Gutiérrez-Pardo A, Pitillas A, Otaegui L, Schneider M, Roters A, Llordés A, Aguesse F, Buannic L. Will the competitive future of solid state Li metal batteries rely on a ceramic or a composite electrolyte? Sustain. Energy Fuels, 2, 2325 - 2334 (2018)

Buannic L, Sperrin L, Dervisoglu R, Blanc F, Grey C P. Proton distribution in Sc-doped BaZrO3: a solid state NMR and First Principle Calculations Analysis. Phys. Chem. Chem. Phys, 20, 4317 - 4328 (2018)

Buannic L, Orayech B, Lopez Del Amo JM, Carrasco J, Katcho N, Aguesse F, Manalastas W, Zhang W, Kilner J, Llordés A. Dual substitution strategy to enhance Li+ ionic conductivity in Li7La3Zr2O12 solid electrolyte. Chem. Mater., 29, 1769 - 1778 (2017)

Aguesse F, Manalastas W, Lopez Del Amo JM, Buannic L, Llordés A, Kilner J. Investigating the dendritic growth during full cell cycling of garnet electrolyte in direct contact with Li metal. ACS Appl. Mater. Interfaces, 9, 3808 - 3816 (2017)

Buzlukov A, Mouesca JM, Buannic L, Hediger S, Simonin L, Canevet E, Colin JF, Gutel T, Bardet M. Li-rich Mn/Ni layered oxide as electrode material for lithium batteries: a 7Li NMR study revealing segregation into (nanoscale) domains with highly different electrochemical behaviors. J. Phys. Chem. C, 120, 19049 - 19063 (2016)

Buannic L, Colin JF, Rey M, Chakir M, Patoux S. Electrochemical performances and gassing behavior of high surface area titanium niobium oxides. J. Mater. Chem. A, 4, 11531 - 11541(2016)

Kinyanjui FG, Norberg ST, Knee CS, Ahmed Is, Hull S, Buannic L, Hung I, Gan Z, Blanc F, Grey C P, Eriksson SG. Crystal structure and proton conductivity of BaSn0.6Sc0.4O3-δ: Insights from X-ray, neutron, solid-state and impedance studies. J. Mater. Chem. A, 4, 5088 - 5101 (2016)

Yamazaki Y, Blanc F, Okuyama Y, Buannic L, Lucio-Vega JC, Grey CP, Haile SM. Proton trapping in yttrium-doped barium zirconate. Nature Materials, 12, 647 - 651 (2013)

Buannic L, Blanc F, Middlemiss DS, Grey CP Probing cation and vacancy ordering in the dry and hydrated yttrium substituted BaSnO3 perovskite by NMR spectroscopy and first principles calculations:

implications for proton mobility. Journal of the American Chemical Society, 134, 14483 - 14498 (2012)

Blanc F, Middlemiss DS Buannic L, Palumbo J L., Farnan I, Grey CP. Thermal phase transformations in LaGaO3 and LaAlO3 perovskites: An experimental and computational solid state NMR study. Solid State Nuclear Magnetic Resonance, 42, 87 - 97 (2012)

Buannic L. Solid state NMR study of protonic conductors for applications as electrolyte materials in Solid Oxide Fuel Cells. Ph. D. Thesis, Stony Brook University, NY (2011)

Buannic L, Blanc F, Hung I, Gan Z, Grey CP. Probing the local structures and protonic conduction pathways in scandium substituted BaZrO3 by multinuclear solid state NMR spectroscopy. Journal of Materials Chemistry, 20, 6322 – 6332 (2010)

Presentations

Challenges and Prospects of Ceramic Electrolytes in Li Metal Batteries. 1st World Conference on Solid Electrolytes for Advanced Applications, Pondicherry, India, September 2017

Li7La3Zr2O12 solid Electrolyte: Dual substitution Strategy and Implementation in Li Metal Batteries. 21st International Conference of Solid State Ionics, Padua, Italy, June 2017

Degradation Mechanisms in Cylindrical Li-Ion Batteries During Cell Cycling. Battery Power 2017, Dallas, TX, USA, May 2017

Substituted Garnet Materials for Safer Lithium Ion Batteries: Composition Optimization and Full Cell Application. ECS Conference on Electrochemical Energy Conversion & Storage with SOFC-XIV, Glasgow, United Kingdom, July 2015

Effect of syntheses and post synthetic treatments on mixed titanium niobium oxides for use as negative electrode in high power Li-ion batteries. 223rd Electrochemical Society Meeting, Toronto, Canada, May 2013

Solid state NMR studies of doped BaSnO3 and BaZrO3 protonic conductors: Defect trapping and ionic mobility. Solid State Proton Conductors 15, Santa Barbara, CA, USA, August 2010

Solid state NMR studies of doped BaSnO3 and BaZrO3 protonic conductors: Defect trapping and ionic mobility. European Materials Research Society 2010 Spring Meeting, Strasbourg, France, June 2010

Solid State NMR studies of doped BaSnO3 and BaZrO3 protonic conductors: Defect trapping and ionic mobility. 217th Electrochemical Society Meeting, Vancouver, Canada, April 2010

NMR study of vacancy trapping in perovskite materials for use in Intermediate Temperature Solid Oxide Fuel Cells. 17th Conference on Solid State Ionics, Toronto, Canada, June 2009

NMR study of electrolyte materials for solid oxide fuel cells: yttrium doped barium zirconate. 236th American Chemical Society National Meeting, Philadelphia, PA, USA, August 2008