

# Dumindu Siriwardena, PhD

## Material Scientist | Senior Lecturer (Grade II)

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### Professional Summary-----

A seasoned material scientist and an academic with 7+ years of experience, specialising in various components of rechargeable sodium and lithium-ion batteries (layered oxide and Prussian white cathodes, hard carbon/ graphite anodes and non-aqueous electrolytes), structural and post-mortem analysis and electrochemical characterisation. Proven track record as a researcher with multiple publications and awards. A motivated individual with a can-do attitude, who can work in multicultural and dynamic environments. An expert in active material evaluation, electrochemical data analysis and multitasking.

### Education-----

PhD (Material Science) | 2018 - 2022 | Queensland University of Technology, Brisbane, Australia

BSc. (Special in Chemistry) | 2012 - 2016 | University of Sri Jayewardenepura, Colombo, Sri Lanka

### Areas of Expertise-----

- Sodium-ion batteries
- Inorganic material synthesis
- Hard carbon and graphite anodes
- Glovebox usage and maintenance
- Electrochemical testing methods
- Electron microscopy
- Lithium-ion batteries
- Coin and Pouch cell assembly
- Post mortem analysis
- Collaboration & team work
- X-ray Diffraction
- Task management
- Electrode active material synthesis
- Slurry preparation
- Electrolyte additives
- Battery tester maintenance
- XPS
- Time management
- Layered transition metal oxides & Prussian Blue
- Carbonate-based electrolytes
- Research and Development
- Structural analysis
- Interfacial analysis
- Project & strategic planning

### Professional Experience-----

**Senior Lecturer (Grade II) - The Department of Chemistry, University of Sri Jayewardenepura, Sri Lanka (2026/05 - Present)**

Undergraduate Teaching

Research and Development

**POSTDOCTORAL FELLOW - THE DEPARTMENT OF CHEMISTRY - ÅNGSTRÖM ADVANCED BATTERY CENTRE (2023/04 - 2026/04)**

Main researcher/responsible for planning and managing multiple individual and collaborative (Swedish & EU) projects:

- Project 1: A collaboration with Altris to study novel carbonate-based electrolyte systems in commercial-grade Prussian white and hard carbon systems (optimising electrolytes, understanding failure mechanisms and post-mortem studies) - introduced a new additive and alternative electrolyte compositions to EC:DEC

- Project 2: Synthesised and evaluated novel inorganic layered transition metal oxide cathode materials (NaMnO) for sodium-ion batteries – improved the oxygen stability in high voltage cathodes for sodium batteries
- Project 3: A collaboration with KTH, Altris, and other raw material suppliers to evaluate electrochemical properties and conduct post-mortem analysis of fossil-free synthetic graphite and hard carbon.
- Project 4: CoFBAT (a European Union project) – Studied cell ageing effects of LNMO using XPS and SEM while collaborating with international partners.
- Project 5: Synthesis and characterisation of high nickel content NMC (811 and 90.50.5 variants).

#### **RESEARCH FELLOW - SRI LANKA INSTITUTE OF NANOTECHNOLOGY (SLINTEC) (2022/04 - 2023/03)**

Led the sodium batteries division, collaborating with industrial partners, business development professionals, technology transfer personnel, and universities.

- Project 1: Developed a novel low-cost cathode material for sodium-ion batteries to be used in rural Sri Lanka (TRL3).
- Project 2: Reduced interfacial resistance (to <100  $\Omega$ ) in a novel all-iron redox flow battery chemistry that was made using locally sourced vein graphite.
- Secured ~\$10,000 in funding to establish coin cell testing facilities.

#### **DOCTORAL RESEARCHER - QUEENSLAND UNIVERSITY OF TECHNOLOGY (QUT), AUSTRALIA (2018/02 - 2022/03)**

Thesis title: Design and Characterisation of Layered Transition Metal Oxide Cathode Materials for Sodium-Ion Batteries

- Synthesis, optimisation of electrochemical properties of P2, O3 and anionic redox active materials.
- Actively contributed and published multiple research.
- Awarded a Faculty of Science Executive Dean's Commendation for an Outstanding Doctoral Thesis for 2022.

#### **Software Proficiency-----**

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|-----------------------|----------|----------|
| • DIFFRAC.EVA         | • Origin | • Python |
| • CasaXPS             | • LANDt  | • EClab  |
| • Gamry EChem Analyst |          |          |

#### **List of Publications -----**

- (1) Nabil El Mounafia, M. A., Fatima Halloub, Reza Younesi, Dumindu Pasan Siriwardena, Alexandra E. Ulander, Ismael Saadoun. Eco-friendly and sustainable solutions: Optimized LIB recycling for high-performance supercapacitors. *Journal of Power Sources* 2025, 656.
- (2) Jin, Y.; Liu, H.; Yang, H.; Achchige, D. P. S. T.; Subasi, Y.; Gond, R.; Wang, Y.; Asfaw, H. D.; Chen, S.; Shi, Z. Development of biomass pyrolysis bio-oil as a renewable surface engineering agent for bio-based hard carbon production. *Journal of Power Sources* **2025**, 641, 236824.
- (3) Jayasinghe, S.; Munaweera, I.; Perera, C.; Siriwardena, D. P.; Kottegoda, N. Low-Carbon-Footprint Plasma-Functionalized Coconut-Coir-Based Porous Carbon as an Efficient and Sustainable Adsorbent. *ChemistrySelect* **2024**, 9 (13), e202305164.
- (4) Hapuarachchi, S. N.; Jones, M. W.; Wasalathilake, K. C.; Marriam, I.; Nerkar, J. Y.; Kirby, N.; Siriwardena, D. P.; Fernando, J. F.; Golberg, D. V.; O'Mullane, A. P. Operando Investigation of Silicon Anodes During Electrochemical Cycling in Li-ion Batteries. *Small Methods* **2024**, 8 (7), 2301199.
- (5) Gebert, F.; Gogoi, N.; Siriwardena, D. P.; Naylor, A. J. The Origin of Rapid Capacity Loss in 1, 1, 1-Trifluoroethyl Methyl Carbonate-Based Lithium-Ion Battery Electrolytes. *Advanced Materials Interfaces* **2024**, 11 (36), 2400535.
- (6) Lewis, C. E. M.; Fernando, J. F.; Siriwardena, D. P.; Firestein, K. L.; Zhang, C.; von Treifeldt, J. E.; Golberg, D. V. Vanadium-containing layered materials as high-performance cathodes for aqueous zinc-ion batteries. *Advanced Materials Technologies* **2022**, 7 (4), 2100505.
- (7) Lewis, C.-E. M.; Fernando, J. F.; Siriwardena, D. P.; Firestein, K. L.; Zhang, C.; Golberg, D. V. Carbon-integrated vanadium oxide hydrate as a high-performance cathode material for aqueous zinc-ion batteries. *ACS Applied Energy Materials* **2022**, 5 (4), 4159-4169.
- (8) Jayasinghe, S.; Pasan Siriwardena, D.; Munaweera, I.; Perera, C.; Kottegoda, N. Sustainable synthesis of highly functionalized activated carbon using plasma technology. *ChemPlusChem* **2022**, 87 (10), e202200202.

- (9) von Treifeldt, J. E.; Firestein, K. L.; Fernando, J. F.; Zhang, C.; Siriwardena, D. P.; Lewis, C.-E. M.; Golberg, D. V. The effect of  $\text{Ti}_3\text{AlC}_2$  MAX phase synthetic history on the structure and electrochemical properties of resultant  $\text{Ti}_3\text{C}_2$  MXenes. *Materials & Design* **2021**, *199*, 109403.
- (10) Siriwardena, D. P.; Fernando, J. F.; Wang, T.; Firestein, K. L.; Zhang, C.; Lewis, C. E.; von Treifeldt, J. E.; Golberg, D. V.  $\text{Na}_{0.67}\text{Mn}_{(1-x)}\text{Fe}_x\text{O}_2$  compounds as high-capacity cathode materials for rechargeable sodium-ion batteries. *ChemElectroChem* **2021**, *8* (3), 508-516.
- (11) Siriwardena, D. P.; Fernando, J. F.; Wang, T.; Firestein, K. L.; Zhang, C.; Brand, H. E.; Jones, M. W.; Kewish, C. M.; Berntsen, P.; Jenkins, T. Probing the effect of Mg doping on triclinic  $\text{Na}_2\text{Mn}_3\text{O}_7$  transition metal oxide as cathode material for sodium-ion batteries. *Electrochimica Acta* **2021**, *394*, 139139
- (12) Deshan, A. D. K.; Moghaddam, L.; Siriwardena, D. P.; Strounina, E.; Beltramini, J.; Doherty, W. O. Transforming cotton gin trash to engineered functional carbon structures. *Advanced Sustainable Systems* **2021**, *5* (9), 2100061.
- (13) Zhang, C.; Firestein, K. L.; Fernando, J. F.; Siriwardena, D.; von Treifeldt, J. E.; Golberg, D. Recent progress of in situ transmission electron microscopy for energy materials. *Advanced Materials* **2020**, *32* (18), 1904094
- (14) Zhang, C.; Fernando, J. F.; Firestein, K. L.; von Treifeldt, J. E.; Siriwardena, D. P.; Fang, X.; Golberg, D. V. Crystallography-derived optoelectronic and photovoltaic properties of  $\text{CsPbBr}_3$  perovskite single crystals as revealed by in situ transmission electron microscopy. *Applied Materials Today* **2020**, *20*, 100788.
- (15) Hapuarachchi, S. N.; Wasalathilake, K. C.; Siriwardena, D. P.; Nerkar, J. Y.; Chen, H.; Zhang, S.; Liu, Y.; Zheng, J.-c.; Golberg, D. V.; O'Mullane, A. P. Interfacial engineering with liquid metal for Si-based hybrid electrodes in lithium-ion batteries. *ACS Applied Energy Materials* **2020**, *3* (6), 5147-5152.
- (16) Firestein, K. L.; von Treifeldt, J. E.; Kvashnin, D. G.; Fernando, J. F.; Zhang, C.; Kvashnin, A. G.; Podryabinkin, E. V.; Shapeev, A. V.; Siriwardena, D. P.; Sorokin, P. B. Young's modulus and tensile strength of  $\text{Ti}_3\text{C}_2$  MXene nanosheets as revealed by in situ TEM probing, AFM nanomechanical mapping, and theoretical calculations. *Nano letters* **2020**, *20* (8), 5900-5908.
- (17) Fernando, J. F.; Siriwardena, D. P.; Firestein, K. L.; Zhang, C.; von Treifeldt, J. E.; Lewis, C.-E. M.; Wang, T.; Dubal, D. P.; Golberg, D. V. Enriched pseudocapacitive lithium storage in electrochemically activated carbonaceous vanadium (iv, v) oxide hydrate. *Journal of Materials Chemistry A* **2020**, *8* (26), 13183-13196.
- (18) de Silva, M.; Siriwardena, D. P.; Sandaruwan, C.; Priyadarshana, G.; Karunaratne, V.; Kottegoda, N. Urea-silica nanohybrids with potential applications for slow and precise release of nitrogen. *Materials Letters* **2020**, *272*, 127839.
- (19) Siriwardena, D. P.; Fernando, J. F.; Wang, T.; Firestein, K. L.; Zhang, C.; von Treifeldt, J. E.; Golberg, D. V. Effect of  $\text{Fe}^{3+}$  for  $\text{Ru}^{4+}$  substitution in disordered  $\text{Na}_{1.33}\text{Ru}_{0.67}\text{O}_2$  cathode for sodium-ion batteries: Structural and electrochemical characterizations. *Electrochimica Acta* **2019**, *325*, 134926.

## Awards & Grants-----

Recipient of the ÅForsk travel grant for young researchers in 2025 by the ÅForsk Foundation

Recipient of a Faculty of Science Executive Dean's Commendation for an Outstanding Doctoral Thesis for 2022 from QUT

## References-----

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