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Optoelectronic & Energy Materials Laboratory

Research Field

Atomic Layer Deposition (ALD), Thin Films Technology, Energy Storage Materials, Optoelectronic Materials, Nanomaterials, Semiconductors.

Education

Ph. D., Materials Science and Engineering, National Cheng Kung University, TAIWAN.

Publications

SCI Journal Papers

1. H. N. Pham, T. H. L. Dang, T. K. A. Vo, T. T. Nguyen, X. T. Pham, T. T. T. Nguyen*, W. J. Lee, M. T. Pham, G. P. Chang-Chien, T. N. Pham, Q. V. Lam, D. L. Tran, T. H. Nguyen, V. H. Le, L. T. N. Huynh*, "Ammonium vanadium bronze $(\text{NH}_4)0.5\text{V}_2\text{O}_5$: a novel cathode material for potassium-ion batteries", Journal of Power Sources 666 (2026) 239214. (IF: 7.9, ENERGY & FUELS 41/182, Q1, Cited times: 0)
2. H. N. Pham, T. H. L. Dang, T. T. T. Nguyen, T. T. Nguten, W. J. Lee*, M. T. Pham, G. P. Chang-Chien, Q. V. Lam, T. H. Nguyen, V. H. Le, L. T. N. Huynh*, "Layered $(\text{NH}_4)0.5\text{V}_2\text{O}_5$ as a high-performance cathode for zinc-ion batteries: Structural, electrochemical, and intercalation mechanism insights", Ceramics International xxx (2025) xxx. Article In Press. (IF: 5.6, MATERIALS SCIENCE, CERAMICS 3/33, Q1, Cited times: 1) (<https://doi.org/10.1016/j.ceramint.2025.08.090>)
3. H. N. Pham, T. H. L. Dang, T. T. T. Nguyen, T. T. Nguten, T. N. Pham, T. A. Nguyen, T. K. A. Vo, W. J. Lee*, M. T. Pham, G. P. Chang-Chien, Q. V. Lam, T. H. Nguyen, V. H. Le, L. T. N. Huynh*, "High-performance sodium storage enabled by structural optimization of oxidized $(\text{NH}_4)0.5\text{V}_2\text{O}_5$ ", Journal of The Electrochemical Society 172 (2025) 090516. (IF: 3.3, MATERIALS SCIENCE, COATINGS & FILMS 9/23, Q2, Cited times: 1)
4. J. Joonhuat, P. V. Dommelen*, W. J. Lee, "The improvement of optical properties of tunnel coupled quantum wells of GaAs/AlGaAs by surface plasmonic effects", Physica B 706 (2025) 417128. (IF: 2.8, PHYSICS, CONDENSED MATTER 38/79, Q2, Cited times: 0)
5. M. D. To, T. N. K. Nguyen, T. A. Dao, T. L. H. Doan, M. T. Pham, W. J. Lee, T. H. Nguyen, V. H. Le, L. T. N. Huynh*, "Tunnel-phase α -, β -, and γ - MnO_2 for salt removal in hybrid capacitive deionization", Desalination 605 (2025) 118726. (IF: 9.8, WATER RESOURCES 4/131, Q1, Cited times: 3)
6. **W. J. Lee***, T. W. Hsu, W. L. Lee, T. T. Thai, C. C. Chen*, "Surface modification of carbon felt electrodes with SnO_2 nanocoatings by using the SILAR method for enhanced performance in vanadium redox flow batteries", Applied Surface Science 686 (2025) 162150. (IF: 6.9, MATERIALS SCIENCE, COATINGS

& FILMS 3/23, Q1, Cited times: 5)

7. T. H. L. Dang, T. T. T. Nguyen, H. N. Pham, H. A. Nguyen, M. D. To, T. T. Nguyen, T. N. Pham, D. L. Tran, W. J. Lee, M. T. Pham, A. T. Dao, Q. V. Lam, T. H. Nguyen, V. H. Le, L. T. N. Huynh*, “A high-capacity double-layered (NH₄)_{0.5}V₂O₅ in micro-rods structure for sodium storage”, *Materials Science and Engineering B* 311 (2025) 11793. (IF: 4.6, PHYSICS, CONDENSED MATTER 25/79, Q2, Cited times: 8)
8. T. R. Chen*, S. Y. Chiu, W. J. Lee, Y. S. Tsai, Y. S. Huang, “Graphene-supported organoiridium clusters catalyze N-alkylation of amines via hydrogen borrowing reaction”, *RSC Advances* 14 (2024) 35163-35171. (IF: 4.6, CHEMISTRY, MULTIDISCIPLINARY 75/239, Q2, Cited times: 1)
9. G. L. Wu, K. K. Cheong, W. J. Lee*, C. C. Chang*, “Understanding the lithium-ion battery’s aging mechanisms of mesophase graphite negative electrodes with/without amorphous titanium(IV) oxide nanocoatings by atomic layer deposition”, *Journal of Energy Storage* 73 (2023) 108951. (IF: 8.9, ENERGY & FUELS 29/171, Q1, Cited times: 4)
10. Y. T. Lin, A. Hassanfiroozi, W. R. Jiang, M. Y. Liao, W. J. Lee, P. C. Wu*, “Photoluminescence Enhancement with All-dielectric Coherent Metasurfaces”, *Nanophotonics* 11 (2022) 2701-2709. (IF: 7.5, OPTICS 12/100, Q1, Cited times: 28)
11. T. R. Chen*, Y. T. Chen, Y. S. Chen, W. J. Lee, Y. H. Lin, H. C. Wang, “Iridium/graphene nanostructured catalyst for the N-alkylation of amines to synthesize nitrogen-containing derivatives and heterocyclic compounds in a green process”, *RSC Advances* 12 (2022) 4760-4770. (IF: 3.9, CHEMISTRY, MULTIDISCIPLINARY 74/178, Q2, Cited times: 9)
12. A. Hassanfiroozi, P. S. Huang, S. H. Huang, K. I. Lin, Y. T. Lin, C. F. Chien, Y. Shi, W. J. Lee, P. C. Wu*, “A Toroidal-Fano-Resonant Metasurface with Optimal Cross-Polarization Efficiency and Switchable Nonlinearity in the Near-Infrared”, *Advanced Optical Materials* 9 (2021) 2101007. (IF: 10.05, OPTICS 9/101, Q1, Cited times: 42)
13. W. J. Lee*, X. J. Wang, “Structural, Optical, and Electrical Properties of Copper Oxide Films Grown by the SILAR Method with Post-Annealing”, *Coatings* 11 (2021) 864. (IF: 3.236, MATERIALS SCIENCE, COATINGS & FILMS 9/20, Q2, Cited times: 48)
14. W. J. Lee*, Y. T. Wu, Y. W. Liao, Y. T. Liu, “Graphite Felt Modified by Atomic Layer Deposition with TiO₂ Nanocoating Exhibits Super-hydrophilicity, Low Charge-transform Resistance, and High Electrochemical Activity”, *Nanomaterials* 10 (2020) 1710. (IF: 5.076, PHYSICS, APPLIED 35/160, Q1, Cited times: 25)
15. T. R. Chen*, Y. X. Wang, W. J. Lee, K. H. C. Chen, J. D. Chen, “A reduced graphene oxide supported iridium nanocatalyst for selective transformation of alcohols into carbonyl compounds via a green process”, *Nanotechnology* 31 (2020) 285705. (IF: 3.874, PHYSICS, APPLIED 44/160, Q2, Cited times: 3)
16. T. R. Chen*, Y. S. Lin, Y. X. Wang, W. J. Lee, K. H. C. Chen, J. D. Chen, “Graphene oxide-iridium nanocatalyst for the transformation of benzylic alcohols into carbonyl compounds”, *RSC Advances* 10

- (2020) 4436-4445. (IF: 3.361, CHEMISTRY, MULTIDISCIPLINARY 81/178, Q2, Cited times: 8)
17. W. J. Lee*, Y. H. Chang, "Growth without postannealing of monoclinic VO₂ thin film by atomic layer deposition using VCl₄ as precursor", *Coatings* 8 (2018) 431. (IF: 2.330, Q2, Cited times: 113)
 18. C. L. Ko, Y. L. Kuo*, **W. J. Lee**, H. J. Sheng, J. Y. Guo, "The enhanced abrasion resistance of an anti-fingerprint coating on chrome-plated brass substrate by integrating sputtering and atmospheric pressure plasma jet technologies", *Applied Surface Science* 448 (2018) 88-94. (IF: 5.155, Q1, Cited times: 16)
 19. A. A. Abdul-Hameed, M. A. Mahdi*, B. Ali, A. M. Selman, H. F. Al-Taay, P. Jennings, **W. J. Lee**, "Fabrication of a high sensitivity and fast response self-powered photosensor based on a core-shell silicon nanowire homojunction", *Superlattices and Microstructures* 116 (2018) 27-35. (IF: 2.385, Q2, Cited times: 17)
 20. I. S. Lyubutin, S. S. Starchikov*, A. O. Baskakov, N. E. Gervits, C. R. Lin*, Y. T. Tseng, **W. J. Lee**, K. Y. Shih, "Exchange-coupling of hard and soft magnetic sublattices and magnetic anomalies in mixed spinel NiFe_{0.75}Cr_{1.25}O₄ nanoparticles", *Journal of Magnetism and Magnetic Materials* 451 (2018) 336-343. (IF: 2.683, Q2, Cited times: 16)
 21. I. S. Lyubutin, C. R. Lin*, S. S. Starchikov, A. O. Baskakov, N. E. Gervits, K. O. Funtov, Y. T. Tseng, **W. J. Lee**, K. Y. Shih, J. S. Lee, "Structural, Magnetic, and Electronic Properties of Mixed Spinel NiFe_{2-x}Cr_xO₄ Nanoparticles Synthesized by Chemical Combustion", *Inorganic Chemistry* 56 (2017) 12469. (IF: 4.825, Q1, Cited times: 32).
 22. Y. W. Lu, Y. Tseng, J. S. Lee, **W. J. Lee***, "Lateral-to-vertical growth transition of TiO₂ nanorods grown on FTO-glass substrate by hydrothermal process", *Digest Journal of Nanomaterials and Biostructures* 11 (2016) 507. (IF: 0.945, Q4, Cited times: 4).
 23. L. G. Teoh, J. S. Lee, Y. Tseng, **W. J. Lee***, "Fabrication and Characterization of TiO₂ Nanorod Array Based Visible-Blind Ultraviolet Photodetector by Hydrothermal Process", *Materials Transactions* 57 (2016) 703. (IF: 0.731, Q3, Cited times: 9).
 24. J. H. Lee, S. Y. Tsai, **W. J. Lee**, M. H. Hon, I. C. Leu*, "Fabrication of Three-Dimensionally Structured Titanium Oxide Thin Films by Transfer Printing", *Journal of the American Ceramic Society* 95 (2012) 165. (IF: 2.107, Q1, Cited times: 4).
 25. **W. J. Lee***, M. H. Hon, "An ultraviolet photo-detector based on TiO₂/water solid-liquid heterojunction", *Applied Physics Letters* 99 (2011) 251102. (IF: 3.597, Q1, Cited times: 99).
 26. **W. J. Lee***, M. H. Hon, Y. W. Chung, J. H. Lee, "A three-dimensional nanostructure consisting of hollow TiO₂ spheres fabricated by atomic layer deposition", *Japanese Journal of Applied Physics* 50 (2011) 06GH06. (IF: 1.376, Q3, Cited times: 11).
 27. **W. J. Lee***, M. H. Hon, "Space-limited crystal growth mechanism of TiO₂ films by atomic layer deposition", *Journal of Physical Chemistry C* 114 (2010) 6917. (IF: 4.524, Q1, Cited times: 68).
 28. H. E. Cheng*, **W. J. Lee**, C. M. Hsu, M. H. Hon, C. L. Huang, "Visible light activity of nitrogen-doped TiO₂ thin films grown by atomic layer deposition", *Electrochemical and Solid State Letters* 11 (2008) D81. (IF: 2.001, Q1, Cited times: 53).

29. H. E. Cheng*, **W. J. Lee**, “Properties of TiN films grown by atomic-layer chemical vapor deposition with a modified gaseous-pulse sequence”, *Materials Chemistry and Physics* 97 (2006) 315. (IF: 1.657, Q2, Cited times: 19).
30. H. E. Cheng*, **W. J. Lee**, C. M. Lee, “The effect of deposition temperature on the properties of TiN diffusion barriers prepared by atomic layer chemical vapor deposition”, *Thin Solid Films* 485 (2005) 59. (IF: 1.569, Q1, Cited times: 42).

Research Projects

Funded by the National Science and Technology Council (NSTC) of Taiwan

1. Development of vanadium redox flow battery electrodes with high energy efficiency and long-term charge-discharge stability, Project number: NSTC 112-2221-E-153-001-MY3, 2023/08/01 ~ 2026/07/31. (PI), ongoing.
2. Development of redox flow battery with metal bipolar plates, Project number: NSTC 112-2622-E-153-001, 2023/11/01 ~ 2024/10/31. (PI), finished.
3. Development of high-performance carbon-based energy storage electrodes using atomic layer deposition technology, Project number: NSTC 111-2221-E-153-002, 2022/08/01 ~ 2023/07/31. (PI), finished.
4. Graphite felts modified by nitrogen-doped titanium dioxide nanocoatings of atomic layer deposition as high-performance electrodes for vanadium redox flow batteries, Project number: MOST 110-2221-E-153-004, 2021/08/01 ~ 2022/07/31. (PI), finished.
5. Research on surface modification and application of graphite felt, Project number: MOST 109-2622-E-153-001, 2020/11/01 ~ 2021/10/31. (PI), finished.
6. Development of high surface area vanadium oxide coatings by atomic layer deposition for energy storage electrode, Project number: MOST 108-2622-E-153-001-CC3, 2019/06/01 ~ 2020/05/31. (PI), finished.
7. Process development of two-stage atomic layer deposition for porous vanadium oxide films and its application of fabricating energy-storage-electrodes with high-surface-area, Project number: MOST 106-2622-E-153-002-CC3, 2017/11/01 ~ 2018/10/31. (PI), finished.
8. The growth characteristics and properties of vanadium oxide films by atomic layer deposition (II), Project number: MOST 106-2221-E-153-004, 2017/08/01 ~ 2018/07/31. (PI), finished.
9. The growth characteristics and properties of vanadium oxide films by atomic layer deposition, Project number: MOST 105-2221-E-153-001, 2016/08/01 ~ 2017/07/31. (PI), finished.
10. Low-temperature growth of TiO₂ film on polycarbonate substrate by atomic layer deposition, Project number: MOST 105-2622-E-153-003-CC3, 2016/06/01 ~ 2017/05/31. (PI), finished.
11. Research and Development of high-performance ultraviolet photodetector based on solid-liquid heterojunction, Project number: MOST 104-2221-E-153-003, 2015/08/01 ~ 2016/07/31. (PI), finished.
12. The studies of TiO₂ films grown on FTO-glass substrates by atomic layer deposition and their application for UV-light photodetectors (II), Project number: MOST 104-2221-E-153-003, 2014/08/01 ~ 2015/07/31. (PI), finished.
13. The studies of TiO₂ films grown on FTO-glass substrates by atomic layer deposition and their application for UV-light photodetectors, Project number: NSC 102-2218-E-153-001, 2013/10/01 ~ 2014/09/30. (PI), finished.

Relevant Experience

Prof. Lee's group is mainly engaged in the development and application of functional thin film materials and nanomaterials. Including the use of atomic layer deposition (ALD), electron-beam evaporation, electrochemical deposition, hydrothermal process, successive ionic layer adsorption, and reaction (SILAR) method to fabricate functional materials and apply them to optoelectronic devices and electrochemical energy storage devices. Recently, Prof. Lee's group mainly engaged in surface modification of graphite felts and applied them to vanadium redox flow batteries (VRFBs), supercapacitors, and metal-ion batteries.

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