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Optoelectronic & Energy Materials Laboratory

Research Field

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

Education

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

Publications

1.1 SCI Journal Papers

1.1.1 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", *J. Energy Storage* 73 (2023) 108951. (IF: 9.4, Q1)

1.1.2 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, Q1, Cited times: 12)

1.1.3 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 Adv.* 12 (2022) 4760-4770. (IF: 3.9, Q2, Cited times: 4)

1.1.4 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", *Adv. Optical Mater.* 9 (2021) 2101007. (IF: 10.050, Q1, Cited times: 22)

1.1.5 **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, Q2, Cited times: 32)

1.1.6 **W. J. Lee***, Y. T. Wu, Y. W. Liao, Y. T. Liu, "Graphite Felt Modified by Atomic Layer Deposition with TiO_2 Nanocoating Exhibits Super-hydrophilicity, Low Charge-transform Resistance, and High Electrochemical Activity", *Nanomaterials* 10 (2020) 1710. (IF: 5.076, Q1, Cited times: 15)

1.1.7 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, Q2, Cited times: 3)

1.1.8 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 Adv.* 10 (2020) 4436-4445. (IF: 3.361, Q2, Cited times: 1)

1.1.9 **W. J. Lee***, Y. H. Chang, "Growth without postannealing of monoclinic VO_2 thin film by atomic layer deposition using VCl_4 as precursor", *Coatings* 8 (2018) 431. (IF: 2.330, Q2, Cited times: 39)

1.1.10 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", *Appl. Surf. Sci.* 448 (2018) 88-94. (IF: 5.155, Q1, Cited times: 13)

1.1.11 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 Microstruct.* 116 (2018) 27-35. (IF: 2.385, Q2, Cited times: 15)

1.1.12 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 $NiFe_{0.75}Cr_{1.25}O_4$ nanoparticles", *J. Magn. Magn. Mater.* 451 (2018) 336-343. (IF: 2.683, Q2, Cited times: 15)

1.1.13 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 $NiFe_{2-x}Cr_xO_4$ Nanoparticles Synthesized by Chemical Combustion", *Inorg. Chem.* 56 (2017) 12469. (IF: 4.825, Q1, Cited times: 26)

1.1.14 Y. W. Lu, Y. Tseng, J. S. Lee, **W. J. Lee***, "Lateral-to-vertical growth transition of TiO_2 nanorods grown on FTO-glass substrate by hydrothermal process", *Dig. J. Nanomater. Bios.* 11 (2016) 507. (IF: 0.945, Q4, Cited times: 2)

1.1.15 L. G. Teoh, J. S. Lee, Y. Tseng, **W. J. Lee***, "Fabrication and Characterization of TiO_2 Nanorod Array Based Visible-Blind Ultraviolet Photodetector by Hydrothermal Process", *Mater. Trans.* 57 (2016) 703. (IF: 0.731, Q3, Cited times: 6)

1.1.16 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", *J. Am. Ceram. Soc.* 95 (2012) 165. (IF: 2.107, Q1, Cited times: 3)

1.1.17 **W. J. Lee***, M. H. Hon, "An ultraviolet photo-detector based on TiO_2/water solid-liquid heterojunction", *Appl. Phys. Lett.* 99 (2011) 251102. (IF: 3.597, Q1, Cited times: 88)

1.1.18 **W. J. Lee***, M. H. Hon, Y. W. Chung, J. H. Lee, "A three-dimensional nanostructure consisting of hollow TiO_2 spheres fabricated by atomic layer deposition", *Jpn. J. Appl. Phys.* 50 (2011) 06GH06. (IF: 1.376, Q3, Cited times: 9)

1.1.19 **W. J. Lee***, M. H. Hon, "Space-limited crystal growth mechanism of TiO_2 films by atomic layer deposition", *J. Phys. Chem. C* 114 (2010) 6917. (IF: 4.524, Q1, Cited times: 58)

1.1.20 H. E. Cheng*, **W. J. Lee**, C. M. Hsu, M. H. Hon, C. L. Huang, "Visible light activity of nitrogen-doped TiO_2 thin films grown by atomic layer deposition", *Electrochem. Solid State Lett.* 11 (2008) D81. (IF: 2.001, Q1, Cited times: 51)

1.1.21 H. E. Cheng*, **W. J. Lee**, "Properties of TiN films grown by atomic-layer chemical vapor deposition with a modified gaseous-pulse sequence", *Mater. Chem. Phys.* 97 (2006) 315. (IF: 1.657, Q2, Cited times: 18)

1.1.22 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

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

2.1.1 Development of redox flow battery with metal bipolar plates, Project number: NSTC 112-2622-E-153-001, 2023/11/01 ~ 2024/10/31. (PI), ongoing.

2.1.2 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.

2.1.3 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.

2.1.4 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.

2.1.5 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.

2.1.6 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.

2.1.7 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.

2.1.8 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.

2.1.9 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.

2.1.10 Low-temperature growth of TiO_2 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.

2.1.11 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.

2.1.12 The studies of TiO_2 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.

2.1.13 The studies of TiO_2 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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