

Chao-Ching (Chester) Chiang

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EDUCATION

University of Florida

Ph.D. in Chemical Engineering

M.S. in Chemical Engineering

Gainesville, Florida

01/2022-05/2025

08/2021-07/2023

National Taiwan University

B.S. in Chemical Engineering

Taipei, Taiwan

09/2011-01/2016

AWARDS

ECS Bruce Deal & Andy Grove Young Author Award

2023

PATENTS

Fabrication of TiO₂ Nanotube Arrays by Progressive Anodization of Ti Thin Film on Insulated Substrates

Inventor: **Chiang**, Esquivel-Upshaw, Ren

Application No. US63/690,901

09/05/2024

PUBLICATIONS

Journal Articles

[Google Scholar](#)

- [1] Effect of Substrate Thinning on Temperature Rise in Ga₂O₃ Rectifiers, ECS Journal of Solid State Science and Technology, 2024, **CC Chiang**, JS Li, HH Wan, F Ren, and SJ Pearton
- [2] Achievement of Low Turn-on Voltage in Ga₂O₃ Schottky and Heterojunction Hybrid Rectifiers Using W/Au Anode Contact, AIP Advances, 2024, **CC Chiang**, JS Li, HH Wan, F Ren, and SJ Pearton
- [3] Ultra-Low On-Resistance W/ β -Ga₂O₃ Junction Barrier Schottky Rectifiers, ECS Advances, 2024, **CC Chiang**, JS Li, HH Wan, F Ren, and SJ Pearton
- [4] Effect of Dry Etching to Improve Ohmic Contacts on Bulk, Lightly-Doped β -Ga₂O₃, ECS Journal of Solid State Science and Technology, 2024, **CC Chiang**, JS Li, HH Wan, F Ren, and SJ Pearton
- [5] The Optimization of NiO Doping, Thickness, and Extension in kV-Class NiO/Ga₂O₃ Vertical Rectifiers, Crystals, 2023, **CC Chiang**, JS Li, HH Wan, F Ren, and SJ Pearton
- [6] E-mode AlGa_N/Ga_N HEMTs Using p-NiO Gates, Journal of Vacuum Science & Technology B, 2023, **CC Chiang**, HH Wan, JS Li, F Ren, TJ Yoo, H Kim, and SJ Pearton
- [7] Ion Energy Dependence of Dry Etch Damage Depth in Ga₂O₃ Schottky Rectifiers, Applied Surface Science, 2023, **CC Chiang**, X Xia, JS Li, F Ren, and SJ Pearton
- [8] Enhancing the Hydrophobicity and Antibacterial Properties of SiCN-Coated Surfaces with Quaternization to Address Peri-Implantitis, Materials, 2023, **CC Chiang**, X Xia, V Craciun, MG Rocha, SEA Camargo, FRG Rocha, SK Gopalakrishnan, KJ Ziegler, F Ren, and JF Esquivel-Upshaw
- [9] Selective Wet and Dry Etching of NiO over β -Ga₂O₃, ECS Journal of Solid State Science and Technology, 2022, **CC Chiang**, X Xia, JS Li, F Ren, and SJ Pearton
- [10] Evaluation of Dry Stored Disposable Sensor Strip on Rapid SARS-CoV-2 Detection Platform, Journal of Vacuum Science & Technology B, 2023, **CC Chiang**, CW Chiu, F Ren, CT Tsai, YT Liao, JF Esquivel-Upshaw, and SJ Pearton
- [11] Threshold Ion Energies and Cleaning of Etch Residues During Inductively Coupled Etching of NiO/Ga₂O₃ in BCl₃, ECS Journal of Solid State Science and Technology, 2022, **CC Chiang**, X Xia, JS Li, F Ren, and SJ Pearton
- [12] Analytical Specificity and Microbial Interference Study of a 30-Second Quantitative SARS-CoV-2 Detection Biosensor System, ECS Journal of Solid State Science and Technology, 2022, **CC Chiang**, CW Chiu, F Ren, CT Tsai, YT Liao, JF Esquivel-Upshaw, and SJ Pearton
- [13] Detailed Simulation of Fluid Dynamics and Heat Transfer in Coffee Bean Roaster, Journal of Food Process Engineering, 2017, **CC Chiang**, DY Wu, and DY Kang
- [14] Relationships between the Solution and Solid-State Properties of Solution-Cast Low-K Silica Thin Films, Physical Chemistry Chemical Physics, 2016, **CC Chiang**, CY Su, AC Yang, TY Wang, WY Lee, CC Hua, and DY Kang
- [15] Demonstration of 4.7 kV Breakdown Voltage in NiO/ β -Ga₂O₃ Vertical Rectifiers, Applied Physics Letters, 2022, JS Li, **CC Chiang**, X Xia, TJ Yoo, F Ren, H Kim, and SJ Pearton

- [16] Annealing Temperature Dependence of Band Alignment of NiO/ β -Ga₂O₃, *Journal of Physics D: Applied Physics*, 2022, X Xia, JS Li, **CC Chiang**, TJ Yoo, F Ren, H Kim, and SJ Pearton
- [17] Temperature Dependence of On-off Ratio and Reverse Recovery Time in NiO/ β -Ga₂O₃ Heterojunction Rectifiers, *Journal of Vacuum Science & Technology A*, 2022, JS Li, **CC Chiang**, X Xia, F Ren, and SJ Pearton
- [18] Superior High-temperature Performance of 8 kV NiO/Ga₂O₃ Vertical Heterojunction Rectifiers, *Journal of Materials Chemistry C*, 2023, JS Li, **CC Chiang**, X Xia, HH Wan, F Ren, and SJ Pearton
- [19] Reproducible NiO/Ga₂O₃ Vertical Rectifiers with Breakdown Voltage > 8 kV, *Crystals*, 2023, JS Li, HH Wan, **CC Chiang**, X Xia, TJ Yoo, H Kim, F Ren, and SJ Pearton
- [20] 7.5 kV, 6.2 GW cm⁻² NiO/ β -Ga₂O₃ Vertical Rectifiers with On-off Ratio Greater than 10¹³, *Journal of Vacuum Science & Technology A*, 2023, JS Li, **CC Chiang**, X Xia, HH Wan, F Ren, and SJ Pearton
- [21] Deposition of Sputtered NiO as a p-type Layer for Heterojunction Diodes with Ga₂O₃, *Journal of Vacuum Science & Technology A*, 2023, JS Li, X Xia, **CC Chiang**, DC Hays, BP Gila, V Craciun, F Ren, and SJ Pearton
- [22] Effect of Drift Layer Doping and NiO Parameters in Achieving 8.9 kV Breakdown in 100 μ m Diameter and 4 kV/4 A in 1 mm Diameter NiO/ β -Ga₂O₃ Rectifiers, *Journal of Vacuum Science & Technology A*, 2023, JS Li, **CC Chiang**, X Xia, HH Wan, F Ren, and SJ Pearton
- [23] Thermal Stability of Band Offsets of NiO/GaN, *Journal of Vacuum Science & Technology A*, 2022, X Xia, JS Li, **CC Chiang**, TJ Yoo, F Ren, H Kim, and SJ Pearton
- [24] Rapid SARS-CoV-2 Diagnosis Using Disposable Strips and a Metal-oxide-semiconductor Field-effect Transistor Platform, *Journal of Vacuum Science & Technology B*, 2022, CW Chiu, M Xian, JL Stephany, X Xia, **CC Chiang**, F Ren, CT Tsai, et al.
- [25] Reversible Total Ionizing Dose Effects in NiO/Ga₂O₃ Heterojunction Rectifiers, *Journal of Applied Physics*, 2023, JS Li, **CC Chiang**, X Xia, S Stepanoff, A Haque, DE Wolfe, F Ren, and SJ Pearton
- [26] High Sensitivity CIP2A Detection for Oral Cancer Using a Rapid Transistor-based Biosensor Module, *Journal of Vacuum Science & Technology B*, 2023, M Xian, JL Stephany, CW Chiu, **CC Chiang**, F Ren, CT Tsai, SS Shan, et al.
- [27] Dynamic Switching of 1.9 A/1.76 kV Forward Current NiO/ β -Ga₂O₃ Rectifiers, *ECS Journal of Solid State Science and Technology*, 2022, JS Li, **CC Chiang**, X Xia, CT Tsai, F Ren, YT Liao, and SJ Pearton
- [28] Operation of NiO/ β -(Al_{0.21}Ga_{0.79})₂O₃/Ga₂O₃ Heterojunction Lateral Rectifiers at up to 225° C, *ECS Journal of Solid State Science and Technology*, 2023, HH Wan, JS Li, **CC Chiang**, X Xia, F Ren, H Masten, JS Lundh, J Spencer, et al.
- [29] Comparison of 10 MeV Neutron Irradiation Effects on NiO/Ga₂O₃ Heterojunction Rectifiers and Ni/Au/Ga₂O₃ Schottky Rectifiers, *ECS Journal of Solid State Science and Technology*, 2023, JS Li, X Xia, **CC Chiang**, HH Wan, F Ren, J Kim, and SJ Pearton
- [30] Type-II Band Alignment of NiO/ α -Ga₂O₃ for Annealing Temperatures up to 600° C, *Journal of Vacuum Science & Technology A*, 2022, X Xia, JS Li, **CC Chiang**, TJ Yoo, E Hershkovitz, F Ren, H Kim, J Kim, et al.
- [31] Properties of SiCN Films Relevant to Dental Implant Applications, *Materials*, 2023, X Xia, **CC Chiang**, SK Gopalakrishnan, AV Kulkarni, F Ren, KJ Ziegler, and JF Esquivel-Upshaw
- [32] β -Ga₂O₃ Orientation Dependence of Band Offsets with SiO₂ and Al₂O₃, *Journal of Vacuum Science & Technology A*, 2023, HH Wan, JS Li, **CC Chiang**, X Xia, DC Hays, F Ren, and SJ Pearton
- [33] Impact of Solid-State Charge Injection on Spectral Photoresponse of NiO/Ga₂O₃ PN Heterojunction, *Preprints*, 2023, A Schulte, S Modak, Y Landa, A Atman, JS Li, **CC Chiang**, F Ren, SJ Pearton, and L Chernyak
- [34] Vertical NiO/ β -Ga₂O₃ Rectifiers Grown by Metalorganic Chemical Vapor Deposition, *Journal of Vacuum Science & Technology A*, 2023, HH Wan, JS Li, **CC Chiang**, F Ren, TJ Yoo, H Kim, A Osinsky, F Alema, and SJ Pearton
- [35] 15 MeV Proton Damage in NiO/ β -Ga₂O₃ Vertical Rectifiers, *Journal of Physics: Materials*, 2023, JS Li, **CC Chiang**, X Xia, HH Wan, J Kim, F Ren, and SJ Pearton
- [36] 1 mm², 3.6 kV, 4.8 A NiO/Ga₂O₃ Heterojunction Rectifiers, *ECS Journal of Solid State Science and Technology*, 2023, JS Li, **CC Chiang**, X Xia, HH Wan, F Ren, and SJ Pearton
- [37] Annealing Stability of NiO/Ga₂O₃ Vertical Heterojunction Rectifiers, *Crystals*, 2023, JS Li, HH Wan, **CC Chiang**, F Ren, and SJ Pearton
- [38] High Sensitivity Saliva-based Biosensor in Detection of Breast Cancer Biomarkers: HER2 and CA15-3, *Journal of Vacuum Science & Technology B*, 2024, HH Wan, H Zhu, **CC Chiang**, JS Li, F Ren, CT Tsai, YT Liao, D Neal, JF Esquivel-Upshaw, and SJ Pearton

- [39] Selective and Nonselective Plasma Etching of $(\text{Al}_{0.18}\text{Ga}_{0.82})_2\text{O}_3/\text{Ga}_2\text{O}_3$ Heterostructures, *Journal of Vacuum Science & Technology A*, 2024, HH Wan, **CC Chiang**, JS Li, F Ren, F Alema, A Osinsky, and SJ Pearton
- [40] Breakdown Up to 13.5 kV in $\text{NiO}/\beta\text{-Ga}_2\text{O}_3$ Vertical Heterojunction Rectifiers, *ECS Journal of Solid State Science and Technology*, 2024, JS Li, HH Wan, **CC Chiang**, TJ Yoo, MH Yu, F Ren, H Kim, YT Liao, and SJ Pearton
- [41] Point-of-Care Detection of HER2 and CA 15-3 in Breast Cancer Patients: Dual-Channel Biosensor Implementation, *ECS Journal of Solid State Science and Technology*, 2024, HH Wan, H Zhu, **CC Chiang**, X Xia, JS Li, F Ren, CT Tsai, YT Liao, TC Chou, D Neal, and JF Esquivel-Upshaw
- [42] Sensitive Detection of Oral Leukoplakia: Analyzing P90 Biomarkers in Saliva and Tissue, *Biosensors*, 2024, HH Wan, H Zhu, **CC Chiang**, JS Li, F Ren, CT Tsai, YT Liao, D Neal, J Katz, and JF Esquivel-Upshaw
- [43] Forward Bias Annealing of Proton Radiation Damage in $\text{NiO}/\text{Ga}_2\text{O}_3$ Rectifiers, *Physica Scripta*, 2024, JS Li, **CC Chiang**, HH Wan, MAJ Rasel, A Haque, J Kim, F Ren, L Chernyak, and SJ Pearton
- [44] Cathodoluminescence Studies of Electron Injection Effects in p-type Gallium Oxide, *AIP Advances*, 2024, L Chernyak, A Schulte, JS Li, **CC Chiang**, F Ren, SJ Pearton, C Sartel, V Sallet, Z Chi, Y Dumont, E Chikoidze, and A Ruzin
- [45] Functionalization Process for Commercial Viability: Oral Leukoplakia Detection Using IL-6 Biomarker, *ECS Journal of Solid State Science and Technology*, 2024, HH Wan, H Zhu, **CC Chiang**, X Xia, JS Li, F Ren, CT Tsai, YT Liao, TC Chou, D Neal, J Katz, and JF Esquivel-Upshaw
- [46] Dry and Wet Etching of Single-crystal AlN, *Journal of Vacuum Science & Technology A*, 2024, HH Wan, **CC Chiang**, JS Li, NS Al-Mamun, A Haque, F Ren, and SJ Pearton
- [47] Switching of kV-class Ga_2O_3 Heterojunction Vertical Rectifiers, *Journal of Vacuum Science & Technology A*, 2024, JS Li, **CC Chiang**, HH Wan, MH Yu, YT Lin, YY Yang, F Ren, YT Liao, and SJ Pearton
- [48] Effects of Athermal Carrier Injection on Co-60 Gamma-ray Damage in SiC Merged-PiN Schottky diodes, *Journal of Vacuum Science & Technology B*, 2024, JS Li, **CC Chiang**, HH Wan, SP Stepanoff, F Ren, A Haque, D Wolfe, and SJ Pearton
- [49] MeV Proton and Neutron Damage Effects on Deep-ultraviolet Light-emitting Diodes, *Journal of Vacuum Science & Technology B*, 2024, JS Li, **CC Chiang**, HH Wan, J Kim, S Barke, P Wass, F Ren, JW Conklin, and SJ Pearton
- [50] Lateral NiO/AlN Heterojunction Rectifiers with Breakdown Voltage > 11 kV, *ECS Advances*, 2024, HH Wan, JS Li, **CC Chiang**, MH Rahman, A Haque, F Ren, and SJ Pearton

Conference Proceedings/Abstracts

- [1] E-Mode AlGaIn/GaN HEMTs Using p-NiO Gates, *ECS Transactions*, 2024, **CC Chiang**, HH Wan, JS Li, F Ren, TJ Yoo, H Kim, and SJ Pearton
- [2] Investigation of Quaternized SiCN Thin Film with Enhanced Hydrophobicity and Antibacterial Features for Dental Implants, **CC Chiang**, H Chou, X Xia, F Ren, and JF Esquivel-Upshaw
- [3] Selective Wet and Dry Etching of NiO over $\beta\text{-Ga}_2\text{O}_3$, *ECS Transactions*, 2023, **CC Chiang**, X Xia, JS Li, F Ren, and SJ Pearton
- [4] 30-Seconds SARS-CoV-2 Human Sample Diagnosis and Analytical Specificity Analysis Using Disposable Strips on a Metal-Oxide-Semiconductor Field-Effect Transistor Platform, *ECS 242*, 2022, **CC Chiang**, CW Chiu, M Xian, F Ren, CT Tsai, YT Liao, JF Esquivel-Upshaw, and SJ Pearton
- [5] Ionization Thresholds and Residue Removal in Inductively Coupled Etching of $\text{NiO}/\text{Ga}_2\text{O}_3$ with Ar and BCl_3 , *CS ManTech*, 2023, **CC Chiang**, X Xia, JS Li, F Ren, and SJ Pearton
- [6] Analytical Specificity Study of SARS-CoV-2 Virus Detection with Biosensing Semiconductor-based System, *FLAVS*, 2022, **CC Chiang**, CW Chiu, F Ren, CT Tsai, YT Liao, JF Esquivel-Upshaw, and SJ Pearton
- [7] Fabrication and Device Performance of 2.7 kV/2.5 A $\text{NiO}/\text{Ga}_2\text{O}_3$ Heterojunction Power Rectifiers, *ECS Transactions*, 2023, X Xia, JS Li, **CC Chiang**, F Ren, and SJ Pearton
- [8] $\text{NiO}/\beta\text{-(Al}_x\text{Ga}_{1-x})_2\text{O}_3/\text{Ga}_2\text{O}_3$ Heterojunction Lateral Rectifiers with Reverse Breakdown Voltage > 7 kV, *ECS Transactions*, 2023, HH Wan, JS Li, **CC Chiang**, X Xia, F Ren, H Masten, JS Lundh, J Spencer, F Alema, A Osinsky, AG Jacobs, KD Hobart, MJ Tadjer, and SJ Pearton
- [9] Determination of Type II Band Alignment of $\text{NiO}/\alpha\text{-Ga}_2\text{O}_3$ For Annealing Temperatures Up To 600°C , *ECS Transactions*, 2023, X Xia, JS Li, **CC Chiang**, TJ Yoo, E Hershkovitz, F Ren, H Kim, J Kim, DW Jeon, JH Park, and SJ Pearton,

- [10] 4.7 kV Reverse Breakdown Voltage Ultra-Thin Double-layered NiO/ β -Ga₂O₃ P-N Junction Rectifiers, ECS 242, 2022, JS Li, **CC Chiang**, X Xia, TJ Yoo, F Ren, H Kim, and SJ Pearton
- [11] Analytical Specificity Study of SARS-CoV-2 Virus Detection with Biosensing Semiconductor-Based System, GRACE, 2022, **CC Chiang**, CW Chiu, F Ren, CT Tsai, YT Liao, JF Esquivel-Upshaw, and SJ Pearton
- [12] Operation up to 225° C of NiO/ β -(Al_{0.21}Ga_{0.79})₂O₃/Ga₂O₃ Heterojunction Lateral Rectifiers, ECS Transactions, 2024, HH Wan, JS Li, **CC Chiang**, X Xia, F Ren, H Masten, JS Lundh, J Spencer, F Alema, A Osinsky, AG Jacobs, KD Hobart, M Tadjer, and SJ Pearton
- [13] Demonstration of Record Breakdown up to 13.5 kV in NiO/ β -Ga₂O₃ Vertical Rectifiers, Device Research Conference, 2024, JS Li, HH Wan, **CC Chiang**, TJ Yoo, MH Yu, F Ren, H Kim, YT Liao, and SJ Pearton

RESEARCH EXPERIENCES

University of Florida, Ren Research Lab

Gainesville, Florida

Position: Graduate Research Assistant

08/2021-Present

Position: Ph.D. student (Advisor: Prof. Fan Ren)

08/2021-Present

- **Ultrawide bandgap semiconductor devices**

- Designed, fabricated, and characterized high-performance β -Ga₂O₃ Schottky diodes, NiO/ β -Ga₂O₃ PN junction rectifiers, and NiO-gated GaN HEMTs.

- Studied wet and dry etching process refinement of device fabrication.

- Excelled in the operation of advanced semiconductor device fabrication and characteristic equipment including photolithography, E-beam evaporator, PECVD, ICP etching, SEM, RIE, etc.

- **Semiconductor device finite element simulation**

- Simulated electrical properties of different designs of NiO/ β -Ga₂O₃ PN junction rectifiers

- Investigated thermal dissipation solutions on Ga₂O₃ thinned-down substrate devices.

- **Biosensor detection platform development**

- Developed a handheld sensor platform for detecting qualitative results of COVID-19, breast cancer, and oral cancer in saliva.

- **Surface coating and modification of dental implants**

- Modified silicon carbon nitride surface and examined the antibacterial ability for the prevention of peri-implantitis through bacteria and cell culture.