
Li-Kai (Ander) Lin, PhD

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Scientist • Semiconductor Engineer • Hardware/Software Engineer

PROFILE

- Seasoned Scientific Research Engineer with 17-years of hands-on experience in semiconductor, biomedical, computer science, and nanotechnology engineering fields.
- Proven ability to align team performance and lead innovative projects and experiments that produce cutting-edge, profitable commercial products through translation of stakeholder specifications into actionable objectives.
- Collaborative team leader with strong communication skills adept in a range of product and process development across electrical engineering, mechanical engineering, chemical engineering, and manufacturing engineering.

STRENGTHS

- Semiconductor Processing
- Microelectronics
- Material Science Engineering
- Biomedical Engineering
- CAD/TCAD/COMSOL Multiphysics
- Integrated Circuit Processing
- Programming Languages
- Software Engineering
- Lean Manufacturing / Six Sigma
- Able to Work in High-Volume Setting
- Research and Development
- Collaborative Team Member
- Written & Verbal Communication
- Decision-Making / Problem Solving
- Bilingual English, Mandarin Chinese

EDUCATION

- **PhD – Materials Engineering** – (*Semiconductor and Biosensor Fab*) (GPA 4.0) 2019
Purdue University West Lafayette, IN
- **Bachelor of Science – Computer Science** (GPA 4.0) 2020
Auburn University Auburn, AL
- **Master of Science – Materials Engineering** (*Specialized in Semiconductors*) 2015
University of Southern California Los Angeles, CA
- **Master of Science – Nanotech and Microsystems Engineering** (*Nanostructure Fab*) (GPA 4.0) 2009
National Cheng Kung University Tainan, Taiwan
- **Bachelor of Science – Materials Science and Engineering** 2007
Bachelor of Science – Civil Engineering 2007
National Cheng Kung University Tainan, Taiwan

EXPERIENCE

Research Scientist (pre-manufacture R&D research team) 2015 – 2019
Purdue University – Birck Nanotechnology Center West Lafayette, IN

- Worked on the SMART thin film consortium pre-manufacture research and development processes team.
- Worked with 20+ top professors/teams from various departments (EE, BME, ME, and MSE) at Purdue University.
- Partnered with industrial companies toward developing thin film applications and commercial products.
- Fulfilled requests from industry partners and factories to develop prototypes of novel commercial products.
- Presented research achievements in Industry Days at the end of each term (April and Nov) to industry partners.

R&D Intern

Taiwan Semiconductor Manufacturing Company, Ltd. (TSMC) 2017
Hsinchu, Taiwan

- Worked within the Advanced Tool and Module Development Division specific to research and development.
- Developed thin film and metal gate (MG) and Tungsten deposition for 7 nm process (W/TiN/SiO₂/Si).
- Improved tungsten film uniformity by 40% and range reduction by 40%.
- Optimized dual zone heater within wafer nucleation % and range of MG fill tungsten with new heating element.
- Evaluated and optimized CIP hardware, playing a pivotal role in hardware setup and achieving Tier I schedule.
- Optimized tungsten ALD (nucleation) and CVD (bulk) coating with various parameters (gas injection: Ar, WF₆, H₂).
- Investigated temperature tuning window at different zone ratio settings.
- Analyzed heat distribution on wafer during tungsten CVD/ALD process using in-situ wireless sensor wafer.
- Instrumented wafer for process temperature monitoring.
- Performed Base Station 300Z, wafer viewer, and Thermal Map 3 operations.
- Analyzed tungsten thin film morphology using an ellipsometer; evaluated tungsten thin-film thickness, resistivity.

Intern (Testing Lab)

2014

Health One Pharmaceuticals, Inc. (Ascent America Laboratories)

City of Industry, CA

- Developed SOPs for 8 medical packaging product lines to standardize product manufacturing sequences.
- Performed E. coli, Enterobacteriaceae, and staph tests to examine and prevent contaminated medicines.
- Executed component analyses to ensure products contained intended components using FTIR and HPLC.
- Performed chemical analyses, quality analyses, quality controls, and product line controls to reduce defects.
- Met safety protocols in design of experiments and promoted collaboration in teamwork and partnerships.

Application Engineer

2010 – 2012

Golden Hardpoint, Inc.

Taipei, Taiwan

- Advised super alloy machining and tooling test support on correcting product manufacturing issues.
- Completed technical seminar to exhibit products, boring, drilling, reaming, porting systems, etc. to customers.
- Delivered technical support for product properties, usages, architectures, etc. to maximize service efforts.
- Conducted consumption market analyses to raise consumer purchasing intentions to boring systems.
- Served as a technical manager to supervise a team of five engineers in providing various technical support.

Research Assistant

2003 – 2009

National Cheng Kung University – NCKU Nanotechnology Center

Tainan, Taiwan

- Fabricated nanostructures on gold-coated silicon wafer using multiple cleanroom techniques and nano indenter.
- Designed and developed nano-components for metal-based biochips with SERS techniques to detect virus.
- Completed National Program on Nanotechnology grant subproject using SERS-active substrates for fabrication.
- Conducted Industrial Technology Research Institute (ITRI) grant subproject using microcontact nanoimprint technique and ion-implantation technique with Metal Vapor Vacuum Arc (MEVVA) ion source.
- Fabricated SERS biosensors and studied intensive biomaterials using advanced structure-making techniques.
- Fabricated ion-implanted titanium nitride using metal vapor vacuum arc technique and performed analyses of ion-implanted titanium nitride microstructure and studied the microstructure using OES and XPS.
- Executed metal and alloy surface polishing and contact angle test to analyze metal and alloy surface properties.
- Conducted 3D model construction to fabricate draft of building structures using CAD.

CERTIFICATES / TRAINING

- Certified SEM, TEM, Titan Environmental STEM, Cryo-EM Specialist, Cell Culture Purdue / Gibco / ThermoFisher
- Integrated Circuit Processing, Solid State Processing, Integrated Circuits Lab University of So. California
- Linear Circuits, Six Sigma Georgia Institute of Technology/ University System OF Georgia
- Semiconductor Devices, Semiconductor Physics University of Colorado Boulder
- TCAD, COMSOL Multiphysics (Modeling/Simulation) Udemy, COMSOL

AWARDS / ACKNOWLEDGEMENTS

- Dean's List, Golden Key Honor Society Chapter, The Gamma Beta Phi Honor Society Auburn University – 2020
- Golden Key Honor Society Chapter – (Top 15%) Purdue University – 2019
- Scientific article designated by Wiley-VCH as the “hottest research” Purdue – 2019
- Nominated as a Top 10 Intern among 145 interns in the final run research competition TSMC
- 1st Place in MSE Qualification Examination Purdue - 2015
- Phi Tau Phi Scholastic Honor Society (1st Place) National Chen Kung University – 2009
- Top Ten Scholar Award in Academic Performance National Chen Kung University – 2007

VOLUNTEER EXPERIENCE

- Researcher Sul Ross State University (Dept. of Biology, Geology, & Phys Sci) 2020
- Board Member Taiwanese American Chamber of Commerce of Greater Los Angeles 2013 – 2015
- PR Manager Annual Conferences of World Taiwanese Chambers of Commerce 2014 & 2015

MEMBERSHIPS

- National Society of Professional Engineers
- Institute of Electrical and Electronics Engineers (IEEE)
- Materials Research Society

FEATURED PUBLICATIONS

- Google Scholar:
https://scholar.google.com/citations?hl=zhTW&user=Dox1V54AAAAJ&view_op=list_works&sortby=pubdate
- Li-Kai Lin et al. "Cost-Effective Methods to Nanopattern Thermally Stable Platforms on Kapton HN Flexible Films Using Inkjet Printing Technology to Produce Printable Nitrate Sensors, Mercury Aptasensors, Protein Sensors, and Organic Thin Film Transistors," *ArXiv*. (Preprint).
- Jung-Ting Tsai, Li-Kai Lin, et al. "The influence of Bi₂O₃ glass powder in silver paste on fabricating ohmic contacts and its potential effectiveness in solar cells and integrated circuits on p-type silicon substrates," *ArXiv*. (Preprint).
- Susana Díaz-Amaya, Li-Kai Lin, Renee E. DiNino, Carlos Ostos, Lia A Stanciu, "Inkjet printed electrochemical aptasensor for detection of Hg²⁺ inorganic solvents", *Electrochimica Acta*, 2019. (IF: 6.2) (SCI paper)
- Elizabeth A Phillips, ..., Li-Kai Lin, Lia A Stanciu, Jacqueline C Linnes, "Microfluidic Rapid and Autonomous Analytical Device (microRAAD) to Detect HIV from Whole Blood Samples", *Lab on a Chip*, 2019. (IF: 6.9) (SCI paper)
- Li-Kai Lin, Lia A Stanciu "Bisphenol A detection using gold nanostars in a SERS improved lateral flow immuno-chromato-graphic assay", *Sensors and Actuator B: Chemical*, Vol. 276, pp 222-229, 2018. (IF: 7.1) (SCI paper)
- Li-Kai Lin, Aytekin Uzunoglu, Lia A Stanciu, "Aminylated and thiolated PEG-covered gold nanoparticles with high stability and anti-aggregation for lateral flow detection of bisphenol A", *Small*, 2017. (IF: 11.459) (SCI paper)

TECHNICAL SKILLS

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|-------------------------------|--|
| • Programming/Systems | Java, C, C++, C#, Python, Scratch, Algorithm, Software Construction, HTML, CSS, JavaScript, jQuery, Node.js, Express.js, Embedded JavaScript templates, Git, MySQL, MongoDB, Assembly Language, Fortran, Linux, Windows, OS X |
| • Applications | Origin, Matlab, ImageJ, IntelliJ, MS Office Suite (Word/Excel/PPT), Mendeley, jGRASP, Visual Studio, VS Code, CS50 IDE, Atom, Endnote, Adobe Suite (PhotoShop CC, Illustrator CC), ChemDraw, Clip Studio Paint |
| • CAD/TCAD/Rendering Software | SolidWorks, AutoCAD, CorelCAD, Autodesk Fusion 360, Rhino, Maya, Cheetah COMSOL Multiphysics, Cinema 4D, Silvaco Athena/Atlas, Avogadro, POV-Ray |
| • Industry Specific Software | (Semiconductor) SiView, Wafer Viewer, Thermal Map 3 |
| • Database | SQL, Non-SQL, Data Structure |
| • Hardware | Circuit Processing, Solid State Processing, Integrated Circuits |
| • Electron Microscopy | SEM/EDX, TEM/EDX, STEM, cryo-EM |
| • Lab Techniques | <i>(Semiconductor and nanofabrication)</i> Wafer cleaning, cutting and handling, foup handling and identification (FEOL-transparent, BEOL-green/red), FEOL, RCA clean (H ₂ NO ₄ , NH ₄ OH, HF, H ₂ O ₂ ...), masking, RIE, nanoindentation techniques, hot embossing/UV-curing nanoimprint, plasma cleaning and curing techniques.
<i>(General)</i> Applications of colloidal metals, antibody applications, primer and aptamer applications, serum albumin and buffer solution applications, binding, surface blocking, and washing techniques, protein separation and purification techniques, immuno techniques, ELISA, cell Culture, aseptic techniques, western blot, blood smear staining/mounting |
| • Equipment | <i>(Semiconductor and nanofabrication)</i> Applied Materials SEMvision G4 and G6 platforms, profilometer, ellipsometer, SMIF, E-Beam, spin coater, CVD, PVD, ALD, mask aligner, micro-plasma, microwave asher, CSAM, XPS, XRD, XRF,TGA, DMA, focused ion beam (FIB) and electron beam system, inkjet printing nanofabrication system, R2R system, AFM, nanoindenter, ultrafast laser, probe station, semiconductor analyzer, overhead hoist transfer (OHT) system, multimeter, waveform generator
<i>(General and Bio)</i> Spectrometer equipment (FTIR, UV-Vis, Raman), Pipettes, microfluidic/lateral flow assays, centrifuge, pH meter, zetasizer, tissue culture ware (flasks, petri dishes, conical flask), incubators (37°C, 5% CO ₂), optical microscope, oil lense, surface area and porosity instruments, gas pycnometer, coulter counter, contact angle meter, confocal nano focus microscopy, BET, electrophoresis chamber system, cell counter, sonicator |
| • Semiconductor Processing | Thermal oxidation of silicon, photolithography, thin film deposition, diffusion, etching, assembly, packaging, LBL growth of semiconducting materials, plasma etch, plasma deposition, electroplating, metal gate Tungsten thin film optimization, FIB and TEM thin film cross section analyses, circuit SEM image analyses, electrical characterization with probe station and semiconductor analyzer, OTFT, MOSTFETs fabrication. |

SIGNIFICANT PROJECTS

Auburn University

2019 – 2020

Website (Front-End), Website (Back-End), Self-made web browser, Github: <https://github.com/linnps/Ander100>

Purdue University

2015 – 2019

Major Project 1 (electrical)

SMART thin film consortium (pre-manufacture R&D research team)

Industry Partners: United Technologies, Applied Materials, Eli Lilly, and the Battery Innovation Center

- Fabricated and analyzed metallic traces (electrodes), flexible circuits (substrates: Kapton and PET), and *organic field effect/thin film transistors* (OFETs/OTFTs) in Class 1 (ISO 3) clean room (Purdue).
- Designed and developed layer-by-layer MOSFETs and BGBC OFETs/OTFTs, including the thin film deposition of metallic (gate, source, and drain electrodes) and dielectric films (gate dielectric) using traditional lithography and new approaches (inkjet printing, screen printing, roll to roll (R2R), and ultrafast laser sintering systems).
- Performed electrical characterization (resistivity, mobility, carrier concentration) of semiconductor, including Hall effect analysis, I-V, and CV profiling using a probe station equipped with a semiconductor analyzer.
- Performed quality analyses and thin film characterization using FIB cross-sectioning (organic semiconductor/source and drain/dielectric/gate), FEG-TEM, EDS, STEM, AFM, profilometer, XRD, and XPS.
- Performed defect identification of circuits and transistors using OM and SEM.
- Collaborated across teams for PCB sensor board design and fabrication, the investigation of thin-film mechanical properties, image processing for metallic patterns, and electrical simulations of the fabricated thin-films.

Major Project 2 (biomedical/electrochemical/biological)

Grants: *NIAID(R61AI40474)*, *NSF(DGE-1333468)*, *USDA (8072-42000-077-00D)*, *Bill & Melinda Gates Foundation*

- Portable biosensors (electrochemical and microfluidic) for the detection of inflammation markers/Cancer (Matrix metalloproteinase 9, MMP-9), viruses (HIV), small molecule and heavy metal contaminants (Hg^{2+} and BPA), and bacteria (*E. Coli*) as well as the study of Parkinson's disease (PD) from alpha-synuclein (A53T)
- Performed biosensor (MMP-9/Cancer, HIV, Hg^{2+} , BPA, *E. Coli*) fabrications with the treatment of antibody IgG, ssDNA aptamers, collagenase, HIV viral particles, human blood cells, bacteria, blocking agents, etc.
- Synthesized polymer-functionalized inorganic nanoprobe conjugated with biological components (IgGs and aptamers) to increase the stability and decrease the limit of detection of electrochemical and microfluidic sensing.
- Developed nondegradable resistive microheaters with nanosilver ink to improve automated sample heating in diagnostics to demonstrate both isothermal nucleic acid amplification at 65 °C and bacterial culture at 37 °C.
- Developed a point-of-care microfluidic rapid and autonomous analysis device (microRAAD), including vitrified amplification reagents, thermally actuated valves for fluidic control, and a temperature control circuit for low-power heating, that automatically detects HIV RNA from whole blood.
- Performed morphology observation of alpha-synuclein and phospholipids for the effects of neurotoxicity.
- Investigated potential causes of Parkinson's disease through the variation of mouse/human alpha-synuclein and various human-mouse chimeras using negative staining, TEM, and cryo-EM.
- Performed characterization for fabricated biosensors using CV, PEIS, electrophoresis, HPLC, FTIR, Raman (SERS), ELISA, and LFAs. (Cyclic Voltammetry, Impedance spectroscopy)
- Led ten-person team to finish all missions across projects and fabricate 10+ biosensors within four years.
- Fabricated biosensors with novel approaches and led to prestigious publications and selected journal cover.

Birck Nanotechnology Center

2015 – 2019

- Basic flexible electronics on PET phases 1&2, Small molecule contaminant and bacteria detection phases 1&2
- Basic flexible electronics on Kapton phase 1, OFETs on Kapton phases 1-3, Inflammation marker and heavy metal detection phases 1-5, neurotoxicity research phases 1-5, HIV detection phases 1-5
- OFETs application phases 1&2, pesticide detection phases 1, printed microheater phases 1&2.

University of Southern California

2015

Major Project

Performed MOSFETs (NMOS, PMOS), diodes, capacitors, and resistors fabrication from a bare silicon wafer with the fabrication technology (Thermal oxidation, lithography with HMDS and photoresist, etching with HF and NH_4F , and metallization with e-beam) in a Class 100 (ISO 5) cleanroom and performed IC defect identification and IC electrical characterization (I-V and CV profiling).

National Cheng Kung University

2009

Major Project

Nanostructure fabrication for SERS sensor development in a class 1000 (ISO 6) cleanroom (2009)