LIURUI LI

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EDUCATION

Virginia Tech, Blacksburg, VA *Sep 2020*
Doctor of Philosophy - Mechanical Engineering GPA: 3.70
Virginia Tech, Blacksburg, VA *Jun 2017*
Master of Science - Mechanical Engineering GPA: 3.81
Shandong University, Shandong, China *Jun 2015*
Bachelor of Science - Mechanical Engineering GPA: 3.42

SKILLS

Competencies

- Machinery designing: GD&T, Design for Manufacturing, Design for Assembly, and DVP&R
- Rapid Prototyping: CNC-machining, Laser Cutting, Laser Micro-milling, and 3D Printing
- Electro-mechanical system control with motion-control card, Matlab, PLCs, and LabVIEW
- Production process R&D utilize Design of Experiments(DOE) and statistical process control(SPC)
- Li-ion Battery R&D: Electrode Coating, Cell Assembly, Rate/Cycle Performance Test, and Data Analysis

Softwares

- 2D and 3D CAD modeling: PTC Creo, UG NX, Solidworks, and AutoCAD
- Engineering statistics: Minitab, JUMP, Origin, and Matlab
- Battery Test System: LandMonitor, LandDataProcessor, and EC-Lab

WORK EXPERIENCES

Mechanical Engineer - Battery R&D Intern, Li-industries *May 2018 - Jan 2019*

- Designed the battery slicing machine for recycling end-of-life Li-ion batteries from iPhone 6Plus. Performed leading role on **proof of concept**, **Creo CAD design**, and **DVP&R**.
- Optimized the operating parameters of the battery cathode powder recovery process with **Fractional Factorial DOE**. Drafted **SOPs** for front-line workers.
- Troubleshooted the **filtration system** of a commercial Filter Drier with PTFE Hydrophobic Membrane Filters. Improved powder-liquid separation efficiency from 75.0% to 97%.
- Worked closely with **OEMs** to facilitate the delivery of key machineries for the battery disassembly line.

Mechanical Engineer Intern, Joyoung Company Limited *Jun 2014 - Aug 2014*

- Designed the plastic battery module shell for portable household appliances. Applied **structural FEA** with Abaqus.
- Generated 3D model and 2D drawing of the plastic battery module shell with SolidWorks and AutoCAD.

RELEVANT PROJECTS

Automated Production System Design and Prototype for Recycling End-of-life Li-ion Batteries

- Designed and prototyped transporters, fixers, and endeffectors for precision battery material handling in the **automated** disassembly system with **UGNX** and multiple **rapid prototyping** techniques.
- Designed and implemented the **mechatronic system** with micro-controller boards and LabVIEW. Integrated 14 stepper/servo motors, 3 pneumatic fixtures, 2 pressure sensors, and 3 industrial cameras.
- Design failure analysis utilizing **Fishbone Diagrams** and **DFMEA**.
- Cooperated closely with Industrial Engineers on building computer vision based **closed loop** smart control system for defects elimination.

Production process R&D for recycling end-of-life Li-ion batteries

- Optimized operating parameters of cathode separation and re-energizing process by **Taguchi DOE** methods and **regression analysis**.
- Evaluated properties of the re-energized lithium cobalt oxide materials by **SEM**, **ICP**, and **XRD** tests.
- Characterized electrochemical performance of the re-energized **lithium cobalt oxide** materials. Performed slurry mixing, electrode coating, **cell assembly**, rate/cycle performance test, and data analysis.

Thin film coating process R&D for perovskite solar cell membrane printing

- Designed and prototpyed slicone-based multiplexed-electrospray system for perovskite solar cell **thin film coating**. Achieved an average power conversion efficiency of 14.7%.
- Innovated micro-through-hole laser drilling technique towards silicone material. Enabled nozzle fabrication on silicone sheet utilizing fiber laser.
- Optimized fabrication parameters of the laser micro-milling process on silicone material by **Taguchi** DOE methods. Decreased production period of linear nozzle array from 12h to 0.5h.

Potential Energy Driven Self-Steering Vehicle Design and Prototype

- Designed and modeled the mechanism of the power train and inner cam guided self-steering system with **Solidworks**. Simulated the motion trail of the designed vehicle with **Adams** motion simulation.
- Machined parts with **wire-electrode cutting**, **CNC milling**, **lathing** and **3D printing**.
- Manually **assembled** the prototype vehicle. Tripled the university record on this project in the test run.

PUBLICATIONS & PATENTS

1. **Liurui Li**, Panni Zheng, Tairan Yang, Robert sturges, Michael W. Ellis, Zheng Li. Disassembly Automation for Recycling End-of-Life Lithium-Ion Pouch Cells.The Journal of The Minerals, Metals Materials Society. 71.12 (2019): 4457-4464.
2. **Liurui Li**, Zheng Li. Parameter Optimization and Yield Prediction of Cathode Coating Separation Process for Direct Recycling of End-Of-Life Lithium-Ion Batteries. Chemical Communications. Under review.
3. **Liurui Li**, Weiwei Yang, Xinyan Zhao, Weiwei Deng. Multiplexed Electrospray (MES) Emitters Fabricated by Rapid Laser Micromachining. Journal of Aerosol Science. Under final revision.
4. Yuanyuan Jiang, Congcong Wu, **Liurui Li**, Kai Wang, Zui Tao, Fan Gao, Weifeng Cheng, Jiangtao Cheng,Xin-Yan Zhao, Shashank Priya, et al. All electrospray printed perovskite solar cells.Nano Energy, 53:440448,2018.
5. Zheng Li, Robert Sturges, Jr, **Liurui Li**, Tairan Yang. System and Method for Extracting Recyclable Material. PCT International **Patent**. Application Number:PCT/2018/045006.
6. **Liurui Li**. Air Outlet Device of Water Washing Type Air Purifier. Chinese invention patent. **Patent** Number: CN103673099A.
7. **Liurui Li**. Water Purifier of Water Washing Type Air Purifier. Chinese invention patent. **Patent** Number: CN103663787A.
8. **Liurui Li**.Washing Tank of Washing Type Air Purifier.Chinese invention patent.**Patent** No.CN103657294A.