

Dr. Sontyana Adonijah Graham

Materials & Device Researcher | Sensors, Energy Systems, Electronics & AI-Integrated IoT
sagraham@dgist.ac.kr | [Google Scholar](#) | [ORCID](#)

PROFESSIONAL PROFILE

Materials and device researcher with a Ph.D. in Electronics and Information Convergence Engineering and experience developing functional materials, sensors, energy-harvesting devices, flexible electronics, and IoT-integrated systems. Skilled in device fabrication, electrical and materials characterization, experimental design, data analysis, and multidisciplinary project execution. Currently conducting collaborative research at DGIST and the KAIST InnoCORE PRISM-AI Center, with experience in academic publishing, graduate mentoring, and translating research concepts into functional prototypes.

EDUCATION

2018–2023	Ph.D., Electronics and Information Convergence Engineering Kyung Hee University, Republic of Korea Thesis: Advanced materials and hybrid nanogenerators for sustainable energy harvesting and IoT applications.
2015–2017	M.Sc., Nanoscience and Nanotechnology National Centre for Nanoscience and Nanotechnology, University of Madras, India.
2012–2015	B.Sc., Nanoscience and Nanotechnology Department of Nanotechnology, Acharya Nagarjuna University, India.

RESEARCH EXPERIENCE

Oct. 2025–Present	Postdoctoral Researcher Department of Energy Science & Engineering, DGIST, Republic of Korea; KAIST InnoCORE PRISM-AI Center. • Developing self-powered sensing, mechanical energy-harvesting, and AI-integrated IoT research platforms. • Design experimental platforms integrating sensors, power-management circuits, and wireless IoT monitoring. • Contributing to multidisciplinary research, experimental planning, data interpretation, and graduate mentoring.
Sep. 2023–Aug. 2024	Postdoctoral Researcher Institute for Wearable Convergence Electronics (IWCE), Kyung Hee University, Republic of Korea. • Conducted research on functional materials, hybrid nanogenerators, wearable electronics, and self-powered sensing.
Aug. 2018–Aug. 2023	Ph.D. Researcher Department of Electronics and Information Convergence Engineering, Kyung Hee University, Republic of Korea. • Investigated advanced functional materials and hybrid nanogenerator systems for sustainable energy harvesting, sensing, and IoT applications.
Sep. 2017–Aug. 2018	Researcher Targeted Imaging and Nanomedicine Laboratory, Department of Biomedical Science, Chonnam National University Medical School, Republic of Korea.
Jun. 2016–Apr. 2017	Master's Research Project Microwave Laboratory, Department of Physics, Indian Institute of Technology Madras, India.
May–Jun. 2016	Research Intern Department of Nanoscience and Nanotechnology, Bharathiar University, India.

RESEARCH EXPERTISE

Energy Harvesting & Self-Powered Systems Triboelectric and hybrid nanogenerators; power generation and energy-management integration.	Flexible & Wearable Sensors Mechanical, pressure, motion, and multimodal sensing for wearable and IoT systems.
Functional Materials Polymer composites, electrospun fibers, porous materials, ionic systems, and multifunctional films.	Micro/Nanofabrication Soft/thermal imprint lithography, photolithography, sputtering, PECVD, evaporation, and etching.
Characterization SEM, AFM, KPFM, XRD, XPS, FTIR, Raman, UV–Vis–NIR, dielectric/ferroelectric and electrical measurements.	Modeling & Data Analysis COMSOL Multiphysics, Origin, Autodesk 3ds Max, Fusion, and experimental data interpretation.

SELECTED PUBLICATIONS

1. S. A. Graham et al. "Metal-Organic Framework Embedded Electrospun Fibrous Membranes-Based Hybrid Nanogenerators with Hierarchical Modified Polyamide Films for Mechanical Energy Harvesting and IoT Applications." *Advanced Functional Materials* (2025). [10.1002/adfm.202507125](https://doi.org/10.1002/adfm.202507125)
2. S. A. Graham et al. "Integrated design of highly porous cellulose-loaded polymer-based triboelectric films toward flexible, humidity-resistant, and sustainable mechanical energy harvesters." *ACS Energy Letters* 5 (2020) 2140–2148. [10.1021/acsenenergylett.0c00635](https://doi.org/10.1021/acsenenergylett.0c00635)
3. S. A. Graham et al. "Multifunctional thermochromic dye-integrated hybrid nanogenerator for mechanical energy harvesting and real-time sensing." *Advanced Functional Materials* (2024). [10.1002/adfm.202409608](https://doi.org/10.1002/adfm.202409608)
4. S. A. Graham et al. "Triboelectric charge modulation to understand the electrification process in nanogenerators combined with an efficient power management system for IoT applications." *Nano Energy* 111 (2023) 108413. [10.1016/j.nanoen.2023.108413](https://doi.org/10.1016/j.nanoen.2023.108413)
5. S. A. Graham et al. "Biocompatible electrospun fibers-based triboelectric nanogenerator for energy harvesting and healthcare monitoring." *Nano Energy* 100 (2022) 107455. [10.1016/j.nanoen.2022.107455](https://doi.org/10.1016/j.nanoen.2022.107455)
6. S. A. Graham et al. "Engineering squandered cotton into eco-benign microarchitected triboelectric films for sustainable and highly efficient mechanical energy harvesting." *Nano Energy* 61 (2019) 505–516. [10.1016/j.nanoen.2019.04.081](https://doi.org/10.1016/j.nanoen.2019.04.081)
7. S. A. Graham et al. "Mechanical and Acoustic-Driven Multiferroic-Based Hybrid Nanogenerator for Energy Harvesting and Sensing Applications." *Small* (2024). [10.1002/smll.202308428](https://doi.org/10.1002/smll.202308428)
8. B. Dudem, S. A. Graham et al. "Natural silk-composite enabled versatile robust triboelectric nanogenerators for smart applications." *Nano Energy* 83 (2021) 105819. *Equal first authorship.* [10.1016/j.nanoen.2021.105819](https://doi.org/10.1016/j.nanoen.2021.105819)
9. S. C. Chandrarathna, S. A. Graham et al. "An Efficient Power Management System Using Dynamically Configured Multiple Triboelectric Nanogenerators and Dual-Parameter Maximum Power Point Tracking." *Advanced Energy Materials* 12 (2022) 2103249. [10.1002/aenm.202103249](https://doi.org/10.1002/aenm.202103249)
10. S. C. Chandrarathna, S. A. Graham et al. "Analysis and Experiment of Self-Powered, Pulse-Based Energy Harvester Using 400 V FEP-Based Segmented Triboelectric Nanogenerators and 98.2% Tracking Efficient Power Management IC for Multi-Functional IoT Applications." *Advanced Functional Materials* 33 (2023) 2213900. [10.1002/adfm.202213900](https://doi.org/10.1002/adfm.202213900)

SELECTED CONFERENCE PRESENTATIONS

- "Multiferroic-based triboelectric nanogenerator for energy harvesting and sensing applications." Nano Korea 2023 Symposium, Republic of Korea (Oral).
- "Synthesis of bismuth composite-based hybrid metamaterials for discrete energy harvesting." European Materials Research Society Fall Meeting, Warsaw, Poland (2022, Oral).
- "Electrospun biocompatible fibers as a tribosensor for human body motion." International Symposium on the Physics of Semiconductors and Applications, Jeju, Republic of Korea (2022, Oral).
- "Harsh environment-tolerant and robust triboelectric nanogenerators for mechanical-energy harvesting, sensing and energy storage in a smart home." Korean Physical Society, Republic of Korea (2020, Oral).

SELECTED AWARDS & ACHIEVEMENTS

- Seal of excellence award, European Commission, Horizon Europe Marie Skłodowska-Curie (2025)
- Graduate Student Award, European Materials Research Society Fall Meeting, Warsaw, Poland (2022).
- Excellent Patent Award, BK21 Convergence Future Communication Innovation Talent Cultivation, Kyung Hee University (2021).
- Best Oral Presentation Award, 1st International Virtual Conference on Nanomaterials (2020).
- Best Poster Presentation Award, Polymer Society of Korea (2019).

SELECTED PATENTS

- Cotton-Based Biodegradable Nano Power Generation Device, Korean Intellectual Property Office.
- Smart Home Mechanical Energy Harvesting, Sensing and Energy Storage by Cotton-Based Triboelectric Nanogenerator, Korean Intellectual Property Office.
- Micropatterning to Release High Surface Area Triboelectric Films for Multimode Operation Triboelectric Nanogenerator, Korean Intellectual Property Office.