DISTINGUISHED STAFF FELLOWS AT ORNL

Marm Dixit

Alvin M. Weinberg Fellow

Where and when did you earn your PhD?

I earned my PhD in mechanical engineering from Vanderbilt University in fall 2020.

What was the subject of your dissertation?

My dissertation was focused on investigating processing–structure–function relationships in solid-state batteries.

What was your dissertation's major contribution to your field?

Solid-electrolyte and solid-state batteries are pivotal material technologies that can enable electrification of the transportation sector to provide affordable, high energy density (HED), durable, and safe energy storage. My thesis provided insight into failure mechanisms for several prevalent material alternatives to solid-electrolyte batteries and provided design rationales for achieving improved performance of solid-state batteries.

Who is your ORNL mentor and where are you working on campus?

My mentor is Ilias Belharouak, Electrification section head in the Electrification and Energy Infrastructure Division. I work in the Emerging and Solid-State Batteries Group in the Electrification and Energy Infrastructures Division.

What will your fellowship research focus on?

My fellowship research focuses on evaluating and understanding fundamental behavior of novel solid-electrolyte materials against metallic anode and high-voltage cathodes. This insight is proposed to be leveraged into high-performance devices. Influence of component fabrication routes, device integration steps, and operation protocols on device performance will be investigated to provide energy-storage solutions with techno-economic feasibility.

What is your project's expected contribution to your field?

Scalable production of HED solid-state batteries can significantly impact the mobility industry and help in electrification of the sector. My research will support scalable production of this type of battery for electric vehicles.

In fall 2021, I was awarded a Toyota Young Investigator Fellowship for Projects in Green Energy Technology from the Electrochemical Society. The fellowship provides funding for young scientists and engineers to pursue battery and fuel cell research with an emphasis on unique, innovative, or unconventional technical approaches and the feasibility of the technology to positively impact the field of green energy. My fellowship work will focus on understanding metallic anodes for HED solid-state batteries.

What are your research interests?

My research interests include energy storage and conversion, electrochemistry, synchrotron/neutron science, imaging, heterogeneous catalysis, and big data and machine learning.

What led you to science and your specific discipline?

I was raised with a strong sense of scientific curiosity and wonder, which are the fundamental requirements for scientific pursuit. Energy security concerns, especially in the context of the Indian subcontinent, where I come from, were conducive to my being drawn towards energy conversion and storage technologies for research.

What did you do before coming to ORNL?

Prior to ORNL, I was a graduate student at Vanderbilt University for 4 years under Prof. Kelsey Hatzell. As a part of that, I spent 6 months interning with the Material Physics and Engineering Group at the Advanced Photon Source at Argonne National Laboratory. I was involved in the group's work on high-energy x-ray diffraction and imaging. After receiving my bachelor's degree in mechanical engineering from Charotar University of Science and Technology in Gujarat, India, I spent 4 years at the Indian Institute of Technology–Gandhinagar working on fuel-reforming technologies and heterogenous catalysis.

Could you share an interesting fact or two about yourself?

I am a flautist in the Indian classical music tradition and a published poet. I have contributed to two poetry anthologies. Music and poetry are something I regularly indulge in.

What nonscience topic or activity is important to you and why?

I spend an inordinate amount of time reading, watching movies, stargazing, and doing photography. These activities help me escape from the clutches of facts of scientific nature and escape into borrowed truths of fictional characters.