Scanning NV Magnetometry with ProteusQ™ Platform: Capabilities and Applications for Advanced Materials and Device Research

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Coffee and snacks served before seminar

also on Teams

Abstract: Scanning Nitrogen-Vacancy Magnetometry (SNVM) is a powerful, non-invasive imaging technique that enables spatially-resolved detection of magnetic fields ranging from a few hundred microtesla to several millitesla under ambient conditions. The method exploits the spin-dependent optical response of individual nitrogen-vacancy (NV) centers in a diamond lattice. By monitoring shifts in the Optically Detected Magnetic Resonance (ODMR) spectrum under microwave excitation, SNVM facilitates nanoscale mapping of stray magnetic field landscape with high sensitivity and accuracy.

Qnami (now Quantum Design Switzerland SA) pioneered the development of the world's first commercial scanning NV microscope, ProteusQ™. This platform combines sub-100 nm spatial resolution with quantitative magnetic imaging, enabling investigation of a broad range of systems including 2D materials, spintronic and antiferromagnetic materials, nanoscale current distributions, and advanced magnetic memory architectures.

In this talk, I will introduce the fundamental principles of NV-center magnetometry and the operating concepts underlying scanning NV microscopy, followed by an overview of the ProteusQ™ platform and its measurement capabilities. I will highlight the versatility of ProteusQ™ imaging modalities and operando modules, illustrating how specific modes can be utilized to investigate diverse material systems and magnetic spin textures. I will then review a broad range of application areas and key publications that have successfully employed these techniques.

Bio: Shreyas received his Bachelor's degree in Metallurgical Engineering from the College of Engineering Pune, India, in 2017, and his M.Sc. (2021) and Ph.D. (2025) in Materials Science and Engineering from EPFL, Switzerland. During his Master's research, he worked on semiconductor nanostructure growth, while his doctoral research focused on spin-wave-based memory devices employing hybrid NiFe–YIG nanostructures. His work involved cleanroom nanofabrication and advanced characterization of magnonic devices using techniques such as magnetic force microscopy, GHz-spectroscopy, and Brillouin light scattering microscopy. At Quantum Design SA, he combines his expertise to support product development, the manufacturing of ProteusQ™ and diamond probes, and customer success.

Host: Xiaohui Xu, Research Scientist | xu969@purdue.edu