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Guest Lecture Information

Mark Hersam

Mark C. Hersam is the Walter P. Murphy Professor of Materials Science and Engineering, Director of the Materials Research Center, and Chair of the Materials Science and Engineering Department at Northwestern University. He also holds faculty appointments in the Departments of Chemistry, Applied Physics, Medicine, and Electrical Engineering. He earned a B.S. in Electrical Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 1996, M.Phil. in Physics from the University of Cambridge (UK) in 1997, and Ph.D. in Electrical Engineering from UIUC in 2000. His research interests include nanoelectronic materials, additive manufacturing, scanning probe microscopy, renewable energy, sensors, neuromorphic computing, and quantum information science. Dr. Hersam has received several honors including the Presidential Early Career Award for Scientists and Engineers, TMS Robert Lansing Hardy Award, MRS Mid-Career Researcher Award, AVS Medard Welch Award, U.S. Science Envoy, MacArthur Fellowship, and eight Teacher of the Year Awards. Dr. Hersam has been repeatedly named a Clarivate Analytics Highly Cited Researcher with over 700 peer-reviewed publications that have been cited ~80,000 times. An elected member of the American Academy of Arts and Sciences, National Academy of Engineering, and National Academy of Inventors with over 170 issued and pending patents, Dr. Hersam has founded two companies, NanoIntegris and Volexion, which are suppliers of nanoelectronic and battery materials, respectively. Dr. Hersam is a Fellow of MRS, ACS, ECS, AVS, APS, AAAS, SPIE, and IEEE, and also serves as an Executive Editor of *ACS Nano*.

Chemically Functionalized 2D Materials for Quantum Photonic Science and Technology

Abstract: Layered two-dimensional (2D) materials interact primarily via van der Waals (vdW) bonding, which has created opportunities for heterostructures that are not constrained by epitaxial lattice matching [1]. However, since any passivated surface interacts with another via non-covalent forces, vdW heterostructures are not limited to 2D materials alone. In particular, 2D materials can be integrated with a diverse range of other materials, including those of different dimensionality, to form mixed-dimensional vdW heterostructures [2]. Furthermore, chemical functionalization allows tailoring of the properties of 2D materials and the degree of coupling across heterointerfaces [3]. In this talk, the prospects of mixed-dimensional heterostructures for quantum photonic science and technology will be discussed with a focus on how chemical functionalization can manipulate and enhance single-photon emission in strained 2D transition metal dichalcogenides [4]. In addition to technological implications, this talk will explore fundamental issues including band alignment, doping, trap states, and charge/energy transfer across heterointerfaces [5].

[1] S. Hadke, *et al.*, *Chemical Reviews*, 125, 835 (2025).
[2] M. I. B. Utama, *et al.*, *MRS Bulletin*, 48, 905 (2023).
[3] J. T. Gish, *et al.*, *Nature Electronics*, 7, 336 (2024).
[4] M. I. B. Utama, *et al.*, *Nature Communications*, 14, 2193 (2023).
[5] S. V. Rangnekar, *et al.*, *ACS Nano*, 17, 17516 (2023).