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Abstract

Enabling room temperature ferromagnetism in monolayer MoS2 via in situ iron-doping

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Abstract:
Two-dimensional semiconductors, including transition metal dichalcogenides, are of interest In electronics and photonics but remain nonmagnetic in their intrinsic form. Previous efforts To form two-dimensional dilute magnetic semiconductors utilized extrinsic doping techniques or bulk crystal growth, detrimentally affecting uniformity, scalability, or Curie temperature. Here, we demonstrate an in situ substitution doping of Fe atoms into MoS2 monolayers in the chemical vapour deposition growth. The iron atoms substitute molybdenum sites in MoS2 crystals, as confirmed by transmission electron microscopy and Raman signatures. We uncover an Fe-related spectral transition of Fe:MoS2 monolayers that appears at 2.28 eV above the pristine band gap and displays pronounced ferromagnetic hysteresis. The microscopic origin is further corroborated by density functional theory calculations of dipoleallowed transitions in Fe:MoS2. Using spatially integrating magnetization measurements and spatially resolving nitrogen-vacancy center magnetometry,

Biography:
Dr. Yu joined Stevens Institute of Technology in August 2017 as an associate professor in the Electrical & Computer Engineering Department. He directs the AISecLab at the ECE department. Before his tenure at Stevens, Dr. Yu had been an associate professor in Computer Science at the University of Arkansas at Little Rock, where he also served as the interim chair of the CS department and the director of the Computational Research Center of the university. He has published over 60 impactful research articles which have received more than 9000 citations according to Google Scholar. He has been awarded over 10 research grants and contracts, primarily as Principal Investigator.

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