Abstract Submitted
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A new pathway for the manipulation of magnetism in the dilute ferromagnetic semiconductor (Ga,Mn)As by organic molecules XIAOLEI WANG, HAILONG WANG, DONG PAN, LIXIA LI, XUEZHE YU, JUN LU, JIANHUA ZHAO, State Key Laboratory of Superlattices and Microstructrues, Institute of Semiconductors, Chinese Academy of Sciences, Beijing, China, TIMOTHY KEIPER, ERIC LOCHNER, STEPHAN VON MOLNÁR, PENG XIONG, Department of Physics, Florida State University, Tallahassee, Florida 32306, United States — Holes from Mn doping are known to mediate the ferromagnetic interaction in III-V dilute magnetic semiconductors. We investigated the effects of electron and hole donor molecule species on the surface of (Ga,Mn)As thin films with a focus on elucidating how the molecular coverage could modify the magnetism of the dilute ferromagnetic semiconductor thin films. Mn-doped GaAs thin films with various thicknesses were grown by molecular-beam epitaxy, and the organic molecules were deposited by solution-based self-assembly or vacuum thermal evaporation. Charge-transfer molecules on the surface of the films led to large carrier density modulation, resulting in significant changes in Curie temperature and magnetization. Through proper preparation of the (Ga,Mn)As surface, self-assembled monolayer patterns of organic molecules with sub-75 nanometer linewidth were successfully created by dip-pen nanolithography. This could open a new pathway to controlled nanoscale manipulation of magnetism in dilute magnetic semiconductors with potential applications in hybrid molecular nano-spintronics.

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