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Imaging of single magnetic dopants in III-V semiconductor hosts PAUL KOENRAAD, CEM CELEBI, ANDREI SILOV, ANDREI YAKUNIN, Eindhoven University of Technology, JIAN-MING TANG, MICHAEL FLATTE, University of Iowa, MARIA KAMINSKA, Warsaw University, EINDHOVEN UNI-VERSITY OF TECHNOLOGY COLLABORATION, UNIVERSITY OF IOWA COLLABORATION, WARSAW UNIVERSITY COLLABORATION — We present room-temperature cross-sectional scanning tunneling microscopy (STM) topographic measurements of the acceptor state wave function for Mn dopants in InP and compare with measurements for the nonmagnetic dopants Zn and Cd as well as with previous results for Mn in GaAs[1]. We find a strongly anisotropic "bowtie" shape for the Mn acceptor state wave function in InP, similar to Mn in GaAs, which has a binding energy of 210 meV (compared to 113 meV for Mn in GaAs). The shape for Mn in InP is more symmetric with respect to the 001 plane than Mn in GaAs, which agrees with a general trend for the magnetic and nonmagnetic acceptor state symmetry as a function of acceptor binding energy. We present a new theoretical model based on the surface strain of GaAs (110) that explains why the 001-plane asymmetry of acceptor states seen in STM measurements is much larger than expected from bulk calculations. [1] A. M. Yakunin, et al., Phys. Rev. Lett. 92, 216806 (2004).

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