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Excited states of acceptor-like excitons bound to isolated nitrogen in GaAs D.J. WOLFORD, Department of Physics and Microelectronics Research Center, Iowa State University, E.A. STINAFF, K.W VER STEEG, TYSON D. HOFFMANN, Iowa State — We report on the first observation of the excited states of the hole for acceptor-like excitons bound to isolated nitrogen impurities (N $\cong$ 2 x 10^{18}cm^{-3}) in GaAs under pressure. A large absorption-resonance in both transmission and photoluminescence excitation (PLE) spectroscopy leads to identification of the $2S_{3/2}$ excited-hole-state associated with the ground-state nitrogen isoelectronic bound exciton, known as the N_X state from alloy studies. Comparison to the established EM-theory of Baldereschi and Lipari for excited-state acceptors provides good agreement. We thus deduce the hole ground-state ionization energy, finding 19.2 meV – virtually independent of pressure. These data then also provide direct information about the remaining electron binding energy at isolated N in GaAs, which we find to vary from 0 (level degeneracy with the Γ_1-edge) to some 135 meV, depending upon pressure. These data provide further understanding of the "deep-level" isoelectronic N-trap in GaAs and its alloys, including the here-to-fore elusive $N_\Gamma$state.

Donald Wolford
Iowa State University

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