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Effect of e-h Pairs on the Stability of Bond-Center Hydrogen in Silicon NAGESWARA RAO SUNKARANAM, Department of Physics and Astronomy, Vanderbilt University, SRIRAM DIXIT, Interdisciplinary Materials Science Program, Vanderbilt University, GUNTER LUPKE, Department of Applied Science, College of William and Mary, NORMAN TOLK, Department of Physics and Astronomy, Vanderbilt University, LEONARD FELDMAN, Department of Physics and Astronomy & Interdisciplinary Materials Science Program, Vanderbilt University — Hydrogen injected into silicon at low temperature resides in the bond-centered site, H^+[BC]. This is the most fundamental hydrogen related defect in many covalent semiconductors. Thermal annealing shows H^+[BC] stability up to 150K, and correlates with Si vacancy migration. We report the first observation of the decay of H^+[BC] due to e-h pairs induced by energetic ions. Thin single crystal silicon films containing H^+[BC] ($\sim 35\mu$m) were fabricated to permit subsequent transmission of energetic protons, creating high e-h pair concentrations and minimal displacement damage. In-situ infrared studies revealed a 90% reduction of H^+[BC] sites after a 1.8 MeV proton dose of $50\mu C/cm^2$ at 80K. Recombination of e-h pairs at defect sites is known to cause vacancy diffusion providing another mechanism for loss of H^+[BC]. Our results show the effect of e-h pairs on H^+[BC] stability. We interpret this in terms of the e-h pair/vacancy interaction.

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