Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

**Vibrational Lifetimes and Frequency-Gap Law of Hydrogen Bending Modes in Semiconductors** BAOZHOU SUN, GUNTER LUEPKE, Department of Applied Science, the College of William and Mary, GANG SHI, MICHAEL STAVOLA, Department of Physics, Lehigh University, NAGESWARA SUNKARANAM, SRIRAM DIXIT, NORMAN TOLK, FELDMAN LEONARD, Department of Physics and Astronomy, Vanderbilt University — Vibrational lifetimes of hydrogen and deuterium related bending modes in semiconductors are measured by transient bleaching spectroscopy and high-resolution infrared absorption spectroscopy. We find that the vibrational lifetimes follow a universal frequency-gap law, i.e., the decay time increases exponentially with increasing decay order, with values ranging from 1 ps for a one-phonon process to 265 ps for a four-phonon process. The temperature dependence of the lifetime shows that the bending mode decays by lowest-order multi-phonon process. Our results provide new insights into vibrational decay and the giant isotope effect of hydrogen in semiconductor systems.

Baozhou Sun
Department of Applied Science, the College of William and Mary

Date submitted: 21 Nov 2005 Electronic form version 1.4