Hydrogen In Compound Semiconductors

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Local Vibrational Mode Spectroscopy of Hydrogen in Compound Semiconductors

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Abstract. Infrared (IR) and Raman spectroscopy are useful techniques for characterizing hydrogen-related defects in semiconductors. This paper will focus on hydrogen in compound semiconductors such as AlSb, GaAs, GaN, InP, and ZnO. In most compound semiconductors studied to date, hydrogen forms neutral complexes with donors or acceptors. In GaN:Mg grown by metalorganic chemical vapor deposition, for example, hydrogen forms pairs with Mg acceptors so that the semiconductors is semi-insulating as grown. In ZnO, however, theoretical and experimental work has shown that hydrogen is a shallow donor. We have observed hydrogen local vibrational modes in ZnO annealed in hydrogen gas, allowing us to speculate as to the structure of the hydrogen complex. The use of high pressures in conjunction with IR spectroscopy may provide a means for distinguishing between similar configurations. In GaN:Mg,H, the local vibrational mode exhibits a small shift with pressure. By comparing this shift with the predictions of *ab initio* calculations, we can rule out the bond-centered (BC) configuration.

INTRODUCTION

The addition of impurities to a semiconductor, whether intentional or accidental, affects the electrical properties by introducing energy levels into the band gap. In addition to altering the electronic characteristics of semiconductors, impurities also affect the vibrational properties. When an impurity is introduced into an otherwise perfect crystal, the translational symmetry is broken and one or more new vibrational modes may appear. If a mass defect replaces a heavier host atom, for example, its vibrational frequency will lie above the lattice phonon frequency range [1]. Unlike a lattice phonon, the vibrational mode of the defect is localized in real space and frequency space, and is referred to as a *local vibrational mode* (LVM). The study of LVMs in semiconductors contributes to a fundamental understanding of vibrational dynamics and impurity-host interactions. This area of research is of practical benefit, providing spectroscopic "fingerprints" as well as detailed information about the microscopic structure of technologically relevant defect centers. Reviews of LVMs in semiconductors are given by Newman [2], Barker and Sievers [1], Stavola [3], and McCluskey [4]. Reviews of hydrogen in semiconductors include Clerjaud [5]; Pankove and Johnson [6]; Estreicher [7]; Pearton, Corbett, and Stavola [8]; Haller [9]; and Nickel [10].

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Examples of LVM spectroscopy of hydrogen-related complexes are given for the compound semiconductors GaP, ZnSe, GaN, GaAs, and AlSb. Recent studies.Hydrogen on semiconductor surfaces has been an area of considerable activity over the last . Vibrational properties of hydrogen in compound semiconductors.Hydrogen introduced in compound semiconductors generally forms complexes with atoms of the crystal. They result from the interaction of hydrogen with some dopants, residual impurities and defects.Role of Hydrogen in Semiconductor, Dielectric and Metal Deposition onto InP by Means of Rapid Thermal Low Pressure Metalorganic Chemical Vapor.Hydrogen in Semiconductors: Crystal growth and device processing of IIIV materials, dry etching, GaAs-on-Si and hydrogenation effects. . of III-V Compounds, Journal of The Electrochemical Society, , , Hydrogen in Compound Semiconductors (Materials Science Forum) [S. J. Pearton] on tmdcelebritynews.com *FREE* shipping on qualifying offers.Citation. McCluskey, M. D.; Johnson, N. M. Hydrogen in compound semiconductors. American Vacuum Society Symposium; November ; Baltimore, MD.Infrared (IR) and Raman spectroscopy are useful techniques for characterizing hydrogen?related defects in semiconductors. This paper will focus on hydrogen.The properties of hydrogen in IIIV semiconductors are reviewed. Atomic hydrogen is found to passivate the electrical activity of shallow donor and acceptor.Compound semiconductor interfaces obtained by direct wafer bonding in hydrogen or forming gas. G. KAL STNER, O. BREITENSTEIN, R. SCHOLZ.Large-area wafer bonding of different IIIV compound semiconductors in an First, thermally generated atomic hydrogen was employed to clean the surfaces.The same situation occurs with compound semiconductors. . The only difference between an exciton and an Hydrogen atom is that the mass of the hole is.For the compound semiconductor chips that lie at the heart of many mobile . from 'hydrogen poisoning', an infliction that diminished reliability.Hydrogen in Semiconductors II - Google Books Result Hydrogen in compound semiconductors [electronic resource]. Language: English. Imprint: Washington.In recent years, the use of III-V nitride compound semiconductors such as GaN, bonding technology with the ion cutting process by hydrogen implantation in.Most Compound Semiconductor R&D takes place in Sandia's new Microsystems and Engineering Sciences Applications (MESA) complex. MESA is intended to.Buy Hydrogen in Compound Semiconductors (Materials Science Forum) by S. J. Pearton (ISBN:) from Amazon's Book Store. Everyday low.Local vibrational mode (LVM) spectroscopy of hydrogen and deuterium in GaP, spectroscopy of hydrogen-related complexes in compound semiconductors.by solar water splitting using nitride-based compound semiconductors in an aqueous solution split water molecules to oxygen and hydrogen with the aid of.Novel photocatalytic water splitting solar-to-hydrogen energy conversion: CdLa2 S4 and CdLa2Se4 ternary semiconductor compounds. A. H. Reshaka.

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