Hydrogen sensing of semipolar (11-22) GaN Schottky diodes

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Recently, hydrogen attracts many attentions as an next generation energy source. To accomplish the high efficient hydrogen economy, hydrogen gas can be obtained from water splitting by photoelectrochemical, photocatalytic, photobiological, and nuclear or solar thermal decomposition, which is alternative way of conventional oil refinery process. However, use of hydrogen gas requires extreme cautions to prevent accidental explosion in the field. In this work, prompt, precise, and robust hydrogen sensor using semipolar GaN Schottky diode has been developed. Schottky diodes with semipolar GaN of which crystal structure consists of nitrogen atoms having strong hydrogen affinity beneath the Ga polar surface showed large immediate forward and reverse current responses for hydrogen exposures at room temperature. Schottky barrier height reduction was 0.52 eV for 4 % hydrogen gas in air, and the device operated stably under elevated temperature and low hydrogen concentration environments.