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Hydrogen Generation and Photoelectrochemical Effect of InGaN alloys KRISHNA ARYAL, BED PANTHA, RAJENDRA DAHAL, JING LI, JINGYU LIN, HONGXING JIANG, Texas Tech University — Generation of hydrogen gas, a clean source of energy with the highest conversion efficiency, via water splitting, using renewable resources has attracted tremendous research work in recent years. For producing hydrogen gas, a promising method using semiconductor materials is direct photoelectrolysis by solar water splitting. $In_xGa_{1-x}N$ alloys grown by metal organic chemical vapor deposition (MOCVD) are very promising candidates for water splitting because of their direct band gap which can be tuned to the entire solar spectrum through band gap engineering. It was found that n-GaN has a higher photocurrent density (J_{ph}) at zero bias, while an InGaN alloy provides much higher hydrogen generation rate (R_H) with a small external bias. R_H of about 0.024 mL/min.cm^2 was obtained using an $In_{0.18}Ga_{0.82}N$ as working electrode. The characteristics of time dependent J_{ph} for a prolonged period of time (up to 7 days) showed higher chemical stability of the InGaN electrodes in aqueous solution of HBr.

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