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Selective Defects Passivation of GaInNAs Solar Cells by Hydrogenation[1] MIWA FUKUDA, VINCENT R. WHITESIDE, IAN R. SELLERS, University of Oklahoma, MOHAMED AL KHALFIOUI, MATHIEU LEROUX, CRHEA-CNRS, LUCAS PHINNEY, KHALID HOSSAIN, Amethyst Research Inc. — While GaInNAs has the potential to be a fourth-junction in multi-junction solar cells it has proved difficult to achieve the optimal alloy composition due to the low solubility of nitrogen in these materials. At this point we investigate the possibility of improving the performance of GaInNAs using hydrogenation to selectively passivate mid-gap defects, while preserving the functionality of substitutional nitrogen. Temperature dependent photoluminescence measurements of the intrinsic region of a GaInNAs p-i-n solar cell show a classic "s-shape" associated with localization prior to hydrogenation, while after hydrogenation no sign of the "s-shape" is evident. The preliminary investigations of the effect of hydrogenation on the efficiency of carrier transport in the solar cells will also be presented. Amethyst Research Inc.'s photon-assisted defect mitigation-hydrogenation technique is usually a low temperature process; however, the annealing effects will be de-convoluted from that of hydrogenation.

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