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Local Structure of Amorphous GaNAs Alloys Across the Composition Range ALEJANDRO LEVANDER, University of California, Berkeley, KIN YU, Lawrence Berkeley National Laboratory, SERGEI NOVIKOV, University of Nottingham, ZUZANNA LILIENTAL-WEBER, Lawrence Berkeley National Laboratory, OSCAR DUBON, University of California, Berkeley, TOM FOXON, University of Nottingham, JUNQIAO WU, University of California, Berkeley, WLADEK WALUKIEWICZ, Lawrence Berkeley National Laboratory — Typically only dilute (up to ∼10%) highly mismatched alloys (HMAs) can be grown due to the large differences in atomic size and electronegativity of the host and the alloying elements. Recently, we overcame the miscibility gap of the $GaN_{1-x}As_x$ system using low temperature molecular beam epitaxy (LT-MBE) and successfully synthesized alloys over a wide composition range. In the intermediate composition range ($0.10 < x < 0.75$) the resulting alloys are amorphous. To gain a better understanding of the amorphous structure, the local environment of the As and Ga atoms was investigated using extended x-ray absorption fine structure (EXAFS). The EXAFS analysis shows a high concentration of dangling bonds compared to the crystalline binary endpoint compounds of the alloy system. The disorder parameter was larger for amorphous films compared to crystalline references, but comparable with other amorphous semiconductors. By examining the Ga local environment, the dangling bond density and disorder associated with As-related and N-related bonds could be decoupled. The N-related bonds had a lower dangling bond density and lower disorder. The significant dangling bond density may help explain the difficulty of doping the material.

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