

Composition and band structure of the native oxide nanolayer on the ion beam treated surface of the GaAs wafer

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Detailed information on GaAs oxide properties is important for solving the problem of passivating and dielectric layers in the GaAs-based electronics. The elemental and chemical compositions of the native oxide layer grown on the atomically clean surface of an *n*-GaAs(100) wafer etched by Ar⁺ ions have been studied by synchrotron-based photoelectron spectroscopy. It has been revealed that the oxide layer is essentially enriched in the Ga₂O₃ phase which is known to be a quite good dielectric as compared to As₂O₃. The gallium to arsenic ratio reaches the value as high as [Ga]/[As] = 1.5 in the course of oxidation. The Ga-enrichment occurs supposedly due to diffusion away of As released in preferential oxidation of Ga atoms. A band diagram was constructed for the native oxide nanolayer on the *n*-GaAs wafer. It has been shown that this natural nanostructure has features of a *p*-*n* heterojunction.

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