Orientation and Dielectric Overlayer Effects in InGaP/GaAs HBTs

A. G. Baca[1], C. Monier[1], P. C. Chang[2], M. G. Armendariz[1], R. D. Briggs[1], S. J. Pearton[3]

1 Sandia National Laboratories, Albuquerque, NM 87185-0603
2 Present address, Agilent Technologies, Santa Clara, CA
3 University of Florida, Gainesville, FL

We have studied the emitter orientation and the effect of dielectric overlayers on DC current gain, β, as well as rf performance for InGaP/GaAs HBTs. The orientation effect has been previously reported for AlGaAs/GaAs HBTs [1]. In that work it was found that β was much greater for the $[01\bar{1}]$ orientation compared to the [011] orientation. It was postulated that the piezoelectric effect could be invoked to explain the data.

In the present work, HBTs, non-self-aligned HBTs with 3 μm wide emitters were passivated with either ECR SiON dielectric or PECVD SiN dielectric. For both dielectrics, DC current gain, β, was greater for the $[01\bar{1}]$ orientation compared to the [011] orientation, consistent with the prior work [1]. However, the ECR dielectric showed less of a β difference for the two orientations than the PECVD dielectric. These results are analyzed both in terms of piezoelectric effects and surface passivation effects.

We will also report on other DC and rf measurements of InGaP/GaAs HBTs with correlations to dielectric stress and the emitter orientation. The effect of the WSi emitter metal stress will also be reported.

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[1] H. Ishida and D. Ueda, *IEEE Electron Device Lett.*, **16**, 448 (1995).