TIEDJE, TOM
(University of Victoria, Victoria, BC)

Molecular Beam Epitaxy Growth of GaAs1-xBix Alloys with High Bi Concentrations

T. Tiedje, D. A. Beaton*, R. B. Lewis*, Xianfeng Lu*, M. Masnadi-Shirazi*
Department of Electrical and Computer Engineering, University of Victoria, Victoria, BC *Department of Physics and Astronomy, University of British Columbia, Vancouver, BC

Abstract: In common with other heavy group III and group V elements, bismuth tends to surface segregate during MBE growth of ternary alloys with GaAs. This tendency can be overcome with low growth temperatures and low As overpressure. At low As overpressures a (2x1) reconstruction forms on the surface in the presence of a Bi flux. Growth with this reconstruction is found to facilitate incorporation of high Bi concentrations as well as desirable transport and optical properties. It is remarkable that GaAs1-xBix grown at low temperature (300-350C) shows strong photoluminescence even though low temperature GaAs without Bi is famous for its short carrier lifetime. It appears that the presence of Bi on the growth surface facilitates the growth of high electronic quality material. It is reasonable to expect low defect density material to be associated with high mobility of surface species during growth. Evidence for enhanced surface mobility in the presence of a Bi surface layer is provided by the fact that RHEED oscillations are observed during growth of GaAs1-xBix alloys at 300C, but not during growth of GaAs under the same conditions.