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Gallium beam analysis and implications for the growth of ultrapure GaAs/AlGaAs heterostructures STEFAN SCHMULT, SAM TAYLOR, WERNER DIETSCHE, Max-Planck-Institute for Solid State Research, Heisenbergstr. 1, 70569 Stuttgart, Germany — The low temperature mobility of a two-dimensional electron gas (2DEG) is a perfect probe of the residual level of charged impurities in GaAs/AlGaAs heterostructures grown by molecular beam epitaxy (MBE) [1]. Besides the need of an ultra-high vacuum environment to prevent impurity incorporation during the growth process, pollution may still result from the source materials themselves. We evaluate the purity of Gallium by channeling the evaporated beam through the detection head of a mass spectrometer mounted in cross-beam geometry. It is found, that at the beginning of a growth campaign Gallium-Oxygen and Gallium-Hydrogen compounds represent the sole contaminations resulting from above-average MBE-grade Gallium at our present detection sensitivity [2]. Utilizing the aforementioned Gallium, we obtain in simple single-interface heterostructures 2DEG mobilities exceeding $10^7 \mathrm{cm}^2/\mathrm{Vs}$. This value is not limited by charged residual impurities, as confirmed in 2DEG-density-dependent transport measurements. [1] F. Stern, Appl. Phys. Lett. **43**, 974, (1983). [2] S. Schmult, et al., J. Crystal Growth (2008), doi:10.1016/j.jcrysgro.2008.10.014.

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