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Characterization and Suppression of Anti-Phase-Boundary Defects in GA-AS-ON-SI Films Using SHG and Aspect-Ratio-Trapping FARBOD SHAFIEI, The university of Texas at Austin, MING LEI, Globalfoundries, Malta NY USA, MAN HOI WONG, Sematech, Austin TX USA, MICHAEL DOWNER, The university of Texas at Austin — The semiconductor industry is exploring hetero-epitaxial growth of III-V semiconductors on Si substrates as a way to marry the superior optical properties and high carrier mobility of III-V semiconductors to the established low-cost, high-volume Si platform for electro-optic, solar cell, and high-performance electronics applications. The dominant technical challenge is the III-V film's tendency to form "anti-phase domains" (APDs) — *i.e.*areas of 0.1 to 1 micron lateral size in which polar Ga-As bonds are inverted in neighboring domains, resulting in undesirable Ga-Ga and As-As bonds at the anti-phase boundaries (APBs). To evaluate strategies for suppressing them, a strong need exists for fast, non-destructive methods of detecting APBs that distinguish them from other defects (*e.g.* threading dislocations, or TDs). Here we show that optical SHG characterizes APDs sensitively, selectively and non-invasively. Using SHG as an APD monitor, we then show that growing the GaAs film on a Si substrate patterned with SiO_2 trenches – a strategy originally designed to trap TDs – can also dramatically suppress APDs. While molecular mechanisms by which "aspect-ratio trapping" (ART) suppresses APDs are not yet clear, the high-throughput SHG diagnostic enables unprecedented freedom in exploring effective trench pattern designs

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