Residual Gas Analysis of Reactions between Germane and Tin Tetrachloride for the Optimization (Si)GeSn CVD Growth

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Since the introduction of (Si)GeSn alloys to the world of semiconductors for silicon based photonic applications, the material has become highly desired for both detectors and sources [1]. By capitalizing on the ability to tailor the band gap of the material by varying the Sn content, transforming an indirect bandgap material to a direct, holds great potential for Near to Mid-IR wavelength photonics. The growth of GeSn for devices and material study has been performed by Molecular Beam Epitaxy (MBE) and Chemical Vapor Deposition (CVD), with Plasma-enhanced Chemical Vapor Deposition (PECVD) and its low thermal requirements [2, 3] gaining popularity. The CVD growth of GeSn has been performed using the commercially available precursors Tin tetrachloride (SnCl4) and Germane (GeH4) [4]. To better understand the growth mechanisms of GeSn on a Si (100) substrates using $SnCl_4$ and GeH_4 during the CVD process. Reactions between the two precursors was studied utilizing a differential pumping system for a 300 amu Residual Gas Analyzer (RGA) that was isolated from the CVD reactor. The focus of this talk will be to present the most recent findings from the mass spectra of the interactions between the two precursors.

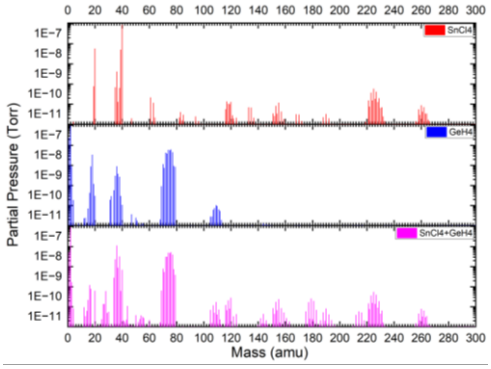

Figure 1: Plot from RGA of $SnCl_4$ (top), GeH_4 (middle), and the combined precursors (bottom).

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