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Formation Mechanism of Self Assembled Horizontal ErSb Nanowires Embedded in a GaSb(001) Matrix[1] NATHANIEL WILSON, STEPHAN KRAEMER, CHRIS PALMSTRM, University of California Santa Barbara — The $Er_xGa_{1-x}Sb$ exhibits a variety of self-assembling nanostructures. In order to harness these nanostructures for use in devices and other material systems it is important to understand their formation. We have characterized the growth mechanism of self-assembled horizontal ErSb nanowires in a GaSb(001) matrix through the use of in-situ Scanning Tunneling Microscopy (STM) as well as ex-situ Transmission Electron Microscopy (TEM). We observe large GaSb macrosteps on the growth surface of $Er_{.3}Ga_{.7}Sb$ samples. The areas near the ledge and base of the macrosteps show significant differences in size and distribution of ErSb nanowires. Results suggest that the formation of macrosteps drives the transition from vertical to horizontal nanowires in the $Er_xGa_{1-x}Sb$ system. We also observe a low temperature growth mode, which results in horizontal nanowire formation under a wide range of flux conditions. This new growth mode does not exhibit the embedded growth observed in the formation of nanowires at higher temperatures and may allow for horizontal nanowire formation without the presence of macrosteps, as well as the formation of smaller nanoparticles which may be useful for achieving smaller nanoparticle dimensions and electron confinement effects.

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