

# Synthesis of 3-dimensional “tree” like nanowire architectures for solar energy conversion

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## ABSTRACT

Synthesis of 3-dimensional tree like nanostructures of ternary III-Sb-N ( $\text{Ga}_{1-x}\text{In}_x\text{N}$  and  $\text{Ga}_{1-x}\text{Sb}_x\text{N}$ ) compounds is of tremendous importance in photoelectrochemical and other solar energy applications. Our earlier studies show that such tree-like architectures for Group III-nitride and Group III-antimonide can be grown without the use of any foreign catalysts. The results showed that the Group III metal mediated one-dimensional growth [1, 2].

Recently, our experiments with Group III-antimonides show that antimony (group V species) droplets can also mediate tip-led growth. Fundamentally, these results have high significance specifically with our rationalization of self-catalysis schemes for nanowire growth and nanoscale, tree-like structures.

Several experiments are conducted to investigate the underlying factors that control tip-led growth of Group III-nitride and Group III-antimonide nanowires. In order to conduct controlled experiments, our CVD reactor is equipped with a home-built, MOCVD precursor delivery system shown in Figure 2 for Group III metal and antimonide species.

Acknowledgements: Authors acknowledge financial support from US Department of Energy (DE-FG02-05ER64071 and DE-FG02-07ER46375) and University of Louisville.

References:

- [1] S. Vaddiraju, et.al. Nano Letters 5(8), 1625-1631(2005)
- [2] H. Li, et.al. Advanced Materials, 18(2), 216 (2006)

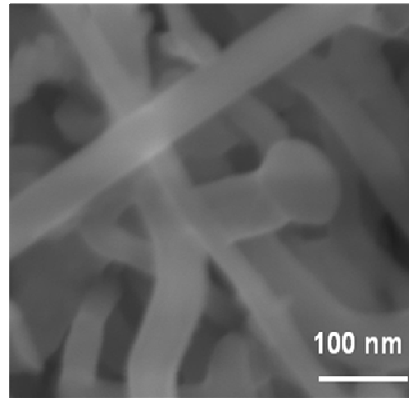


Figure 1: GaSb nanowires grown using a self-catalysis scheme.



Figure 2: Photograph showing our home-built, **MOCVD precursor delivery system.**