Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Synthesis of One-dimensional GaN Nanostructures and Their Implications for Formation Mechanisms HSI-LIEN HSIAO, A.B. YANG, Department of Physics, Tunghai University, M.C. LU, Y.L. CHUEH, L.J. CHEN, L.J. CHOU, Department of Materials Science and Engineering, National Tsing Hua University — One-dimensional GaN nanostructures were successfully synthesized by gold-catalyzed metal-organic vapor phase approach. It was found that GaN whiskers of various morphologies could be synthesized on Si substrates by just controlling the temperature. Amorphous Ga/nitride nanowires formed at 450C with tadpole-like structures. GaN tubular nanostructures synthesized were observed at 600C. Wavy-like hollow interiors with single crystalline wurtzite phase were seen from high-resolution transmission electron microscope images. With increasing the catalytic temperature, crystalline GaN nano-pyramids, and straight nanowires were formed. It is proposed that the morphologies evolution of GaN whiskers was attributed to the competitions of TMG surface diffusion to the Ga-Au eutectic droplets, Ga bulk diffusion into the catalyst, and GaN seeding. While at low temperature, only Ga atoms at surface react with ammonia and form amorphous Ga@nitride nanowires. With increasing the temperature, GaN seeding and the subsequent growth along the circumferential edges of these seeds leads to the evolution of nanotube morphology. Further increasing the temperature, promoted the nitridation efficiency and axial growth rate and lead to the nanowires and nanopyramids growth.

Hsi-Lien Hsiao
Department of Physics, Tunghai University

Date submitted: 01 Dec 2004 Electronic form version 1.4