

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Vapor-solid-solid growth mechanism driven by epitaxial match between solid AuZn alloy catalyst particle and ZnO nanowire at low temperature RODRIGO LACERDA, LEONARDO CAMPOS, MATTEO TONEZZER, ANDRE FERLAUTO, ROGERIO PANIAGO, SERGIO OLIVEIRA, LUIZ ORLANDO LADEIRA, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil, VINCENZO GRILLO, TASC-INFM-CNR National Laboratory, Trieste, Italy — The present paper provides a comprehensive picture of the precise mechanism of ZnO vapor-solid-solid nanowire growth at low temperatures and gives the fundamental reasons responsible [1]. We demonstrate by using a combination of synchrotron XRD and high resolution TEM that the growth dynamics at low temperatures is not governed by the well-known VLS mechanisms. Based on the Au-Zn phase diagram, temperature measurement and temperature size effects, we show that growth occurs via VSS. The precise composition of the Au-Zn catalyst nanoparticle has been determined to be γ -AuZn. Furthermore, we experimentally observe that there is an indication of an epitaxial relationship between the ZnO nanowires and the γ -AuZn seed particle. A critical new insight on the driving factor of VSS growth is proposed in which the VSS process occurs by a solid diffusion mechanism that is driven by a preferential oxidation process of the Zn inside the alloy catalyst induced by an epitaxial match between the ZnO(10-10) plane and the γ -AuZn(222) plane. [1] L. C. Campos et al, Adv. Materials (accepted for publication).

Rodrigo Lacerda
Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

Date submitted: 27 Nov 2007

Electronic form version 1.4