# Synthesis of $In_2O_3$ Nanotrees Using VLS Technique

Fatma Nur Tuzluca,[1,4*] Yaşar Özkan Yeşilbağ,[1,4] Ali Ercan Ekinci [1] and Mehmet Ertuğrul [2,3,4]

[1]*Department of Physics, Erzincan University, Erzincan 24100, Turkey*
[2]*Department of Electrical and Electronics Engineering, Atatürk University, Erzurum 25240, Turkey*
[3]*Department of Nanoscience and Nanoengineering, Atatürk University, Erzurum 25240, Turkey*
[4]*Nanoscience and Nanoengineering Application and Research Center, Atatürk University, Erzurum 25240, Turkey*

**Abstract**—$In_2O_3$ nanotrees have been successfully fabricated from indium (III) oxide powder with the assistance of Au catalysts on the silicon substrate through VLS (Vapor-Liquid-Solid) technique under Ar carrier gas flow at 1000°C. Morphology and optical properties of the nanotrees were analyzed by means of scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray diffraction (XRD) and photoluminescence (PL).

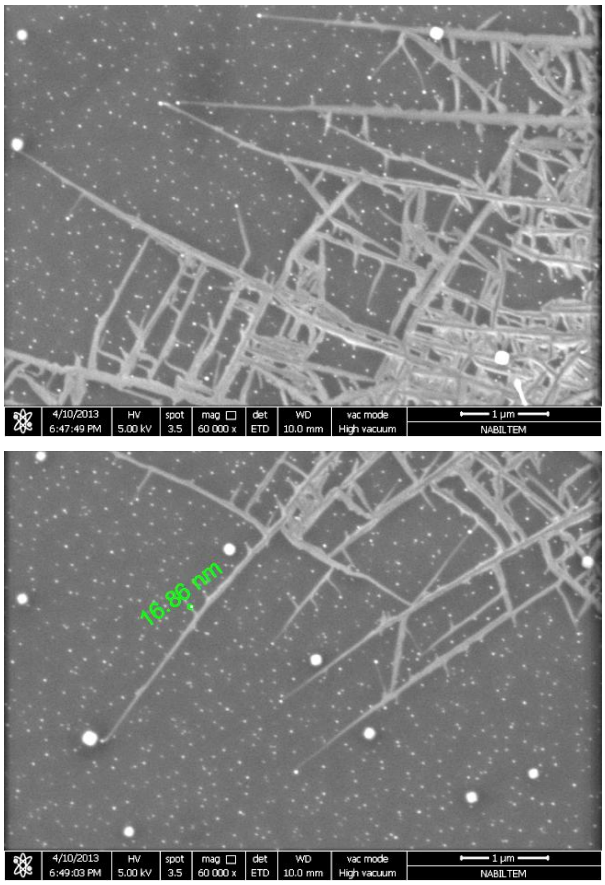



Figure-1: SEM images of $In_2O_3$ nanotrees.

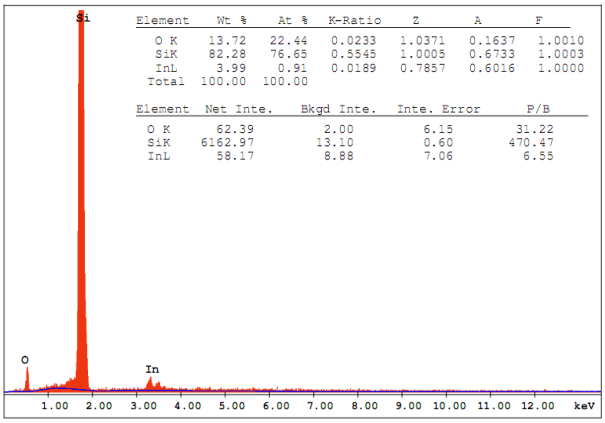



Figure-2: EDX measurement of as-synthesized $In_2O_3$ nanotrees.

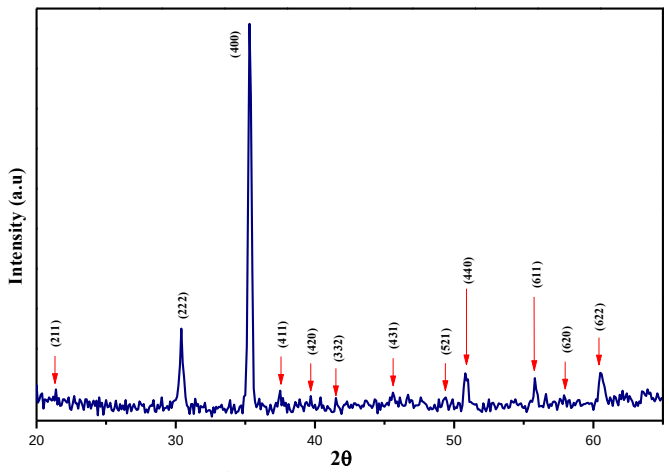



Figure-3: XRD patterns of the as-synthesized $In_2O_3$ nanotrees.

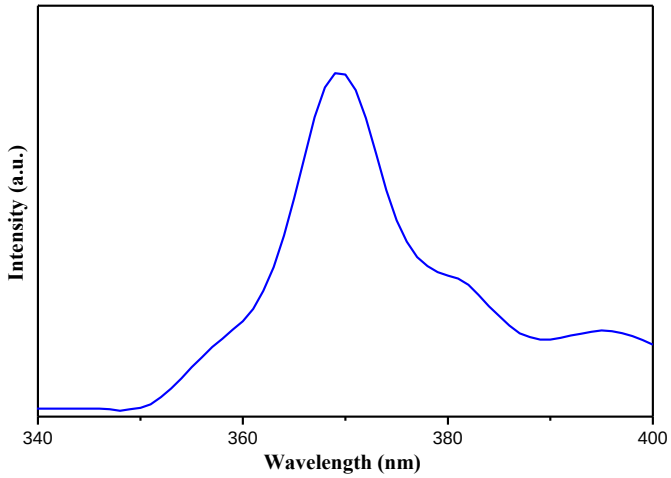



Figure-4: Photoluminescence (PL) spectra of $In_2O_3$ nanotrees at room temperature.

In Fig. 1 SEM images show that there are Au nanoparticles at the tips of both the main body and the branches extending from the main body. In Fig. 2, EDX measurement of as-synthesized nanotrees shows only two elements: In and O. A typical XRD spectrum is attached to Fig. 3 where the diffracted peaks are indexed and indicate cubic phase material. A striking PL feature being observed in the $In_2O_3$ nanotrees is that there exists a strong luminescence band centered at 370 nm (3.35 eV, UV emission) (Fig. 4).

*Corresponding author: ftuzluca@erzincan.edu.tr