World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:12, No:10, 2018

$Ge_{1-x}Sn_x$ Alloys with Tuneable Energy Band Gap on GaAs (100) Substrate Manufactured by a Modified Magnetron Co-Sputtering

Authors : Li Qian, Jinchao Tong, Daohua Zhang, Weijun Fan, Fei Suo

Abstract : Photonic applications based on group IV semiconductors have always been an interest but also a challenge for the research community. We report manufacturing group IV $Ge_{1-x}Sn_x$ alloys with tuneable energy band gap on (100) GaAs substrate by a modified radio frequency magnetron co-sputtering. Images were taken by atomic force microscope, and scanning electron microscope clearly demonstrates a smooth surface profile, and $Ge_{1-x}Sn_x$ nano clusters are with the size of several tens of nanometers. Transmittance spectra were measured by Fourier Transform Infrared Spectroscopy that showed changing energy gaps with the variation in elementary composition. Calculation results by 8-band k.p method are consistent with measured gaps. Our deposition system realized direct growth of $Ge_{1-x}Sn_x$ thin film on GaAs (100) substrate by sputtering. This simple deposition method was modified to be able to grow high-quality photonic materials with tuneable energy gaps. This work provides an alternative and successful method for fabricating Group IV photonic semiconductor materials.

Keywords : GeSn, crystal growth, sputtering, photonic
Conference Title : ICOPLP 2018 : International Conference on Optoelectronics, Photonics and Laser Physics
Conference Location : Osaka, Japan
Conference Dates : October 11-12, 2018