Abstract Submitted
for the OSS18 Meeting of
The American Physical Society

Pulsed laser deposition of high quality rutile and anatase TiO_2 films. PRABIN DULAL, SAHIL AGARWAL, DAVE WINARSKI, FARIDA SELIM, Bowling Green State University — Titanium oxide (TiO_2) is one of the highly sought semiconducting oxide and due to its chemical and thermal stability and broad applicability, it has shown great potential for thin film applications in photo-catalysis, microelectronic devices, optical coatings, etc. In this work, we investigate the dependence of substrate type and growth parameters on TiO_2 phase formation for thin films synthesized by pulsed laser deposition method (PLD) under variable growth conditions and we show how to control TiO_2 structure in PLD process and obtain both pure Anatase and Rutile phases. Thin films of TiO_2 were fabricated by PLD on sapphire and silicon substrates and were characterized by X-ray diffraction (XRD), atomic force microscopy (AFM), optical absorption spectroscopy and Hall-effect measurements. XRD patterns revealed that a sapphire substrate is more suitable for formation of the rutile phase in TiO_2 while silicon substrate yields a pure anatase phase, even at a high temperature growth. AFM images show that the rutile TiO_2 films grown at 805°C on sapphire substrate have a smoother surface than anatase films grown at 620°C. Optical absorption spectra confirmed the band gap energy of 3.08 eV for rutile phase and 3.29 eV for anatase phase. All the deposited films exhibit the usual high resistivity of TiO_2.

Prabin Dulal
Bowling Green State University

Date submitted: 12 Mar 2018 Electronic form version 1.4