Abstract Submitted
for the SES12 Meeting of
The American Physical Society

Ytterbium-doped Barium Zirconate Thin Films by Pulsed Laser Deposition for Intermediate Temperature Solid Oxide Fuel Cell Applications ENRICO CAMATA, ALEX SKINNER, ERIC REMINGTON, RENATO CAMATA, University of Alabama at Birmingham — Ytterbium-doped barium zirconate (BZYb) is predicted to have high protonic conductivity and good potential as a thin-film electrolyte material for intermediate temperature (500-750° C) solid oxide fuel cells. We have synthesized BZYb thin films by pulsed laser deposition using ablation targets prepared by mixing barium zirconate ($BaZrO_3$) and ytterbium oxide (Yb_2O_3) powders. Powders had their masses varied to produce targets with 5, 10, and 15 mol.% of Yb in $BaZrO_3$. Targets where pressed at 2800 psi and annealed at 1200° C for 12 hours in air. Thin films 1-2 μm thick were deposited on Si and MgO substrates at 600° C using a KrF excimer laser with energy density of 1-2 J/cm^2 and repetition rate of 30 Hz. Deposition took place at a pressure of 50 mTorr of O_2 in a vacuum system with base pressure below 5.0x10^{-7} Torr. X-ray diffraction from as-deposited films show patterns of polycrystalline cubic $BaZrO_3$ on both, Si and MgO substrates. A substantial amount of amorphous material is present in as-deposited samples. Post-deposition annealing in air at 800^{o}C greatly improves film crystallinity with virtual elimination of the amorphous phase. Energy dispersive X-ray measurements indicate the successful incorporation of Yb in the films in concentrations of 3.1, 5.5, and 8.8 mol.% for targets prepared with 5, 10, and 15 mol.% of Yb, respectively.

Enrico Camata
University of Alabama at Birmingham

Date submitted: 20 Sep 2012 Electronic form version 1.4