Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

P-type Semiconducting Behavior of $BaSn_{1-x}Ru_xO_3$ system HYUKWOO KWON, JUYEON SHIN, KOOKRIN CHAR, Seoul National University — $BaSnO_3$ is a promising transparent perovskite oxide semiconductor due to its high mobility and chemical stability. Exploiting such properties, we have applied $BaSnO_3$ to the field effect, the 2-dimensional electron gas, and the pn-junction devices. In spite of the success of the K-doped $BaSnO_3$ as a p-type doped, its carrier density at room temperature is rather small due to its high activation energy of about 0.5 eV. In continuation of our previous study on $SrSn_{1-x}Ru_xO_3$ system, we studied the p-type semiconducting behavior of $BaSn_{1-x}Ru_xO_3$ system. We have epitaxially grown the $BaSn_{1-x}Ru_xO_3$ ($0 \leq x \leq 0.12$) thin films by pulsed laser deposition. X-ray diffraction measurements show that the films maintain a single phase over the entire doping range and the lattice constants of the system decrease monotonously as the doping increases. Transport measurements show that the films are semiconducting and their resistivities dramatically decrease as the Ru doping increases. Hall measurement data show that the charge carriers are p-type and its corresponding mobility values vary from $0.3 \sim 0.04$ $cm^2/V{\cdot}s$, depending on the doping rate. The hole carrier densities, measured to be $10^{17} \sim 10^{19}$ $/cm^3$, are larger than those of K-doped $BaSnO_3$. Using $BaSn_{1-x}Ru_xO_3$ and $Ba_{1-x}La_xSnO_3$ as p-type and n-type semiconductors, we will fabricate pn-junctions and report its performance.

Hyukwoo Kwon
Seoul National University

Date submitted: 13 Nov 2014 Electronic form version 1.4