Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Transparent oxide semiconductors (Ba,La)SnO_3 with high mobility at room temperature HYUNG JOON KIM, USEONG KIM, TAI HOON KIM, JIYEON KIM, HOON MIN KIM, BYUNG-GU JEON, WOONG-JHAE LEE, Department of Physics and Astronomy, Seoul National University, HYO SIK MUN, Seoul National University, KWANG TAEK HONG, JAEJUN YU, KOOKRIN CHAR, KEE HOON KIM, Department of Physics and Astronomy, Seoul National University — We present our discovery of (Ba,La)SnO_3 system exhibiting electrical mobility at 300 K of 200-320 $cm^2V^{-1}s^{-1}$ in a doping range from 1.0x10^{19} to 4.0x10^{20} cm^{-3}. Moreover, their conductivity values were as large as around 10^4 S/cm, being comparable to those of indium tin oxides. The system yet shows the optical gap around 3.33 eV and only slight increase of the in-gap states, maintaining visual transparency. Several unique physical properties of (Ba,La)SnO_3 are also discussed: a superior oxygen stability evidenced by persistent transport properties under high temperature environments, a small effective mass coming from the ideal Sn-O-Sn bonding in a cubic perovskite, small disorder effects due to doping away from the main conduction channels (SnO_6 octahedra network) and reduced carrier scattering due to the high dielectric constant. (Ba,La)SnO_3 thus holds great potential for realizing transparent, high power, high temperature functional devices.

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Date submitted: 27 Nov 2012 Electronic form version 1.4