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Systematic investigation of chemical substitution in $BaSnO_3$ using the combinatorial approach[1] ICHIRO TAKEUCHI, JONGMOON SHIN, SEUNGHUN LEE, XIAOHANG ZHANG, H. M. IFTEKHAR JAIM, Dept. of Materials Science and Engineering, University of Maryland, SE-YOUNG JEONG, Dept. of Cogno-Mechatronics Eng., Pusan National University — $BaSnO_3$ has been regarded as a possible material for photo-catalysis, dielectric capacitors, and transparent conductors. We are systematically investigating the effect of chemical substitution for A and B sites in $BaSnO_3$ using a high-throughput methodology. We have thus far investigated the effect of substituting La and Sr for the Ba-site and Pb and Bi for the Sn-site. The composition spread films were prepared on MgO, $SrTiO_3$ and $LaAlO_3$ using combinatorial pulsed laser deposition. The lattice parameters and band-gap energies were found to continually change as a function of the concentration of each substitutional dopant. We find that the band gap can be tuned from 2.8 eV for $BaSn_{0.05}Pb_{0.95}O_3$ to 4.5 eV for $Ba_{0.05}La_{0.95}SnO_3$. Especially for $Ba_{1-x}La_xSnO_3$ with x in the range of $0.05 < x < 0.5$, we consistently observe resistivity as low as 0.23 mΩcm at room temperature while maintaining optical transparency with a typical bandgap of ˜4 eV. The effect of crystalline defects on electrical properties will also be discussed.

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