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Effects of oxygen vacancy on the photoconductivity in BaSnO3[1]
JISUNG PARK, KOOKRIN CHAR, Seoul National University, South Korea, INSTITUTE OF APPLIED PHYSICS, DEPARTMENT OF PHYSICS AND ASTRONOMY, SEOUL NATIONAL UNIVERSITY TEAM — We have found the photoconductive behavior of BaSnO3, especially their magnitude and time dependence, is very sensitive to the oxygen vacancy concentration. We made epitaxial BaSnO3 film with BaHfO3 buffer layer by pulsed laser deposition. As we had reported before, MgO substrate with its large band gap size about 7.8 eV was used to exclude any photoconductance from the substrate. [1] BaHfO3 layer was used to reduce the threading dislocation density in BaSnO3 film. To control the oxygen vacancy concentration in the BaSnO3 film, we annealed the sample in Ar or O2 atmosphere with varying annealing conditions. After each annealing process, photoconductivity of BaSnO3 was measured during illumination of UV light. The result showed that the magnitude of photoconductivity of BaSnO3 increased after annealing at higher temperature in Ar atmosphere, while the changes in the dark current remains minimal. The result can be explained by a hole trap mechanism. Higher Fermi level due to the increased oxygen vacancy concentration can cause occupation of deep acceptor levels in dislocations of the BaSnO3 film. These occupied deep acceptor levels in turn trap photo-generated holes so that the recombination of electron-hole pair is deterred. [1] J. Park et al., Appl. Phys. Lett. 108, 092106 (2016)

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