AuSb Induced Crystallization of Germanium Thin Films
Joseph B. Mutunga¹, Takumi Kondo¹, Tatsuya Suzuki¹, Masao Kamiko², Kentaro Kyuno¹,³
(1. Department of Materials Science, Shibaura Institute of Technology, 2. Institute of Industrial Science, The University of Tokyo, 3. Research Center for Green Innovation, Shibaura Institute of Technology)
E-mail: mb16033@shibaura-it.ac.jp

Introduction
Low temperature (≤ 300°C) growth of polycrystalline germanium thin film is realized by layer exchange mechanism using AuSb alloy. Sb is added to the Au layer in the expectation that it might lower the crystallization temperature, since Sb is known to lower the eutectic temperature of AuGe alloy. Moreover, if Sb is incorporated in the resulting crystalline Ge layer, it might be possible to realize an n-type crystalline Ge thin film at low temperature.

Experiment
20nm Au-0.5% Sb alloy film was evaporated onto a Si wafer covered with 100nm of thermally oxidized SiO₂, which was followed by a sputter deposition of 20nm of amorphous germanium. A bilayer with 20nm of pure Au is also prepared as a reference. The samples were then annealed up to 150-300 °C.

Results and Discussion
Fig 1 (a) and Fig 1 (b) are optical microscope images of the samples after 160°C annealing. It can be observed that nucleation starts to occur for Ge/AuSb, but not for Ge/Au. Fig 2 (a) and (b) are optical microscope images of the samples after 170°C annealing. Surface segregation of Au is observed clearly for Ge/AuSb. In the Raman spectra of the two samples annealed at 250°C, it can be observed that the FWHM of the AuSb sample is smaller than that grown with Au implying a better crystal quality.

Acknowledgements
This work was partly supported by Grant-in-Aid for Scientific Research (Nos. 25289231 and 15K14130) from the Ministry of Education, Culture, Sports Science and Technology of Japan and by the Research Center for Green Innovation, Shibaura Institute of Technology.