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電子線誘起電流法による $SrTiO_3$ 結晶中の転位の電気特性評価

Electron-beam-induced current study of dislocation related defects in $SrTiO_3$ crystal

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Recently, many interests have been paid to investigate the resistance switching in metal/$SrTiO_3$ contacts. It was argued that whether or not the presence of crystallographic defects (mainly dislocations) has important effect on the resistive switching behavior [1, 2]. In this study, we attempted to investigate the electrical activities of dislocations in niobium doped strontium titanate ($SrTiO_3$:Nb) single crystal by electron-beam-induced current (EBIC) method. Fig. 1 shows the secondary electron (SE) and the EBIC images of Pt/(111) $SrTiO_3$ Schottky diode taken at 120 K and 300 K. Dislocations and related defects were visualized as straight and/or curved lines. These lines correspond with the slip dislocations in the slip systems of <110> {110} and <100> {010}. For all kinds of dislocations, their EBIC contrasts were strong at room temperature and became weak at low temperature, suggesting that dislocations in $SrTiO_3$ were accompanied with deep levels and acted as strong recombination center of carriers. Bias-dependent EBIC has found that the EBIC contrast of dislocation gradually decreased at increasing bias. However, there is no direct correlation between resistance switching and dislocations.

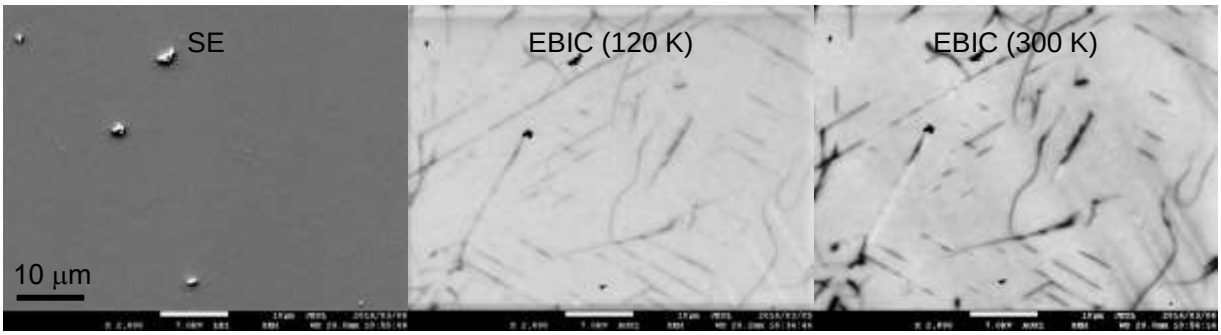

Figure 1. SE and EBIC images of dislocation related defects in (111) $SrTiO_3$ single crystal. The defects showed strong EBIC contrast at room temperature and became weak at low temperature.

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