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The Effects of Misorientation of the GaAs (100) Surface on the Secondary Ion Yield during O_2^+ or Cs^+ Ion Sputtering

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The effects of misorientation on the ion yield during SIMS sputter depth profiling have been studied for the GaAs (100) surfaces miscut by 0°, 2°, 5° and 7°. The MOCVD grown samples with the structure of AlGaInP / GaAs / GaAs (Si doped substrate) were sputtered with 5 keV O_2^+ or Cs^+ primary ion beam at an incident angle of 60° from the surface normal. The relative secondary ion yields of Al and In were measured. In case of Cs^+ primary ion beam, there was no detectable change in the secondary ion yield with the surface misorientations. On the contrary, the analysis with O_2^+ primary ion beam showed a correlation between the change of secondary ion yield and the degree of misorientation of the surface. The relative secondary ion yield increased with increasing the degree of misorientation. In order to investigate this dependence from the topographical point of view, the crater bottoms after sputter erosion were scanned by AFM. The AFM results revealed a close resemblance to the observed correlation between the change of ion yield and the degree of misorientation. The relationship among the degree of misorientation, the secondary ion yield and the topographical change will be discussed.