Oxygen Effects on the Secondary Electron Emission from Si Surface Induced by Low Energy He^+ and Xe^+ Ions

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It is well known that the ripple topography is often produced on a Si surface by low energy O_2^+ ion sputtering in the energy region of a few hundred eV, leading to the degradation of depth resolution in SIMS analysis. This phenomenon depends on the sputtering condition such as ion species, incident energy, incident angle, oxygen concentration at the surface and so on. As the secondary electron emission induced by ion bombardment is affected by surface topography, so there is a possibility that the dynamic roughening process at the surface may be investigated by the secondary electron spectroscopy. To confirm this, in the present study, we measured the secondary electron spectra from Si surface induced by He^+ and Xe^+ ions of 100 eV as a function of oxygen pressure in the experimental chamber: Since the surface oxygen concentration is determined by the balance of sputtering and adsorption, therefore the surface oxygen concentration is proportional to the oxygen pressure.

The experiments were carried out with the Auger electron Microprobe (JAMP-10, JEOL) and floating-type low-energy ion gun [1]. The incident angle of ion beam was 60 degrees from the surface normal, and the detection angle of the secondary electron was from 0 to 42.3 degrease from the surface. As the results, the secondary electron intensity increased with the oxygen pressure for He^+ sputtering, but decreased for Xe^+ sputtering. The relevance of this discrepancy to the ripple formation has been discussed.

References

[1]M.Inoue, R.Shimizu, H.I.Lee, H.J.Kang, *Surf. & Interf. Anal.* **37**(2005)167.