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Secondary charged particle(electron and ion) emission(SCPE) phenomena have been extensively studied for metals by positive ion impact[1-2]. However, there are few investigations of secondary electron and ion emission (SEE and SIE) for oxides by ion impact.

In this study, we have measured the SEE and SIE yields by 0.1-2.5 keV H^- and H^+ impact on oxides such as $SrCe_{0.95}Yb_{0.05}O_3$ (uncleaned surfaces). Fig. 1 shows the SCPE yields per ion vs the beam current I_B . The collector of the secondary electrons or ions and target were grounded. For 2.5 keV H^+ (o), the SEE yield decreases with increasing I_B and above a critical current of ~ 0.1 nA, secondary positive ion emission (+) was observed. Similar results were observed for Be(probably oxidized Be). The decrease of SEE could be due to the increase of the positive surface barrier potential by charge accumulation under H^+ impact which may suppress SEE. However, preliminary experiments show that the negative surface potential of ~ 1 V was accumulated for 100 keV H^+ impact.

For 2.5 keV H^- (o), yields of SEE was nearly constant(~ 1.0) for $I_B > 0.1$ nA in contrast to the results of H^+ impact. As I_B decreases below 0.1 nA, the SEE yields apparently increase. This is partly due to the background stray current.

It is also found that the SEE yields by H^- impact are always larger than

those by H^+ impact. The charge accumulation effect by H^- impact may differ from that by H^+ impact. Electrons loosely bound to H atom may contribute to the SEE, possibly via reflection of these electrons from the surface.

Characterization of surfaces of oxide targets is of primary importance. The secondary ions are to be identified. The charge accumulation effect, the dependence of SEE and SIE yields on the ion energy, and the energy distributions of the secondary charged particles are to be investigated.

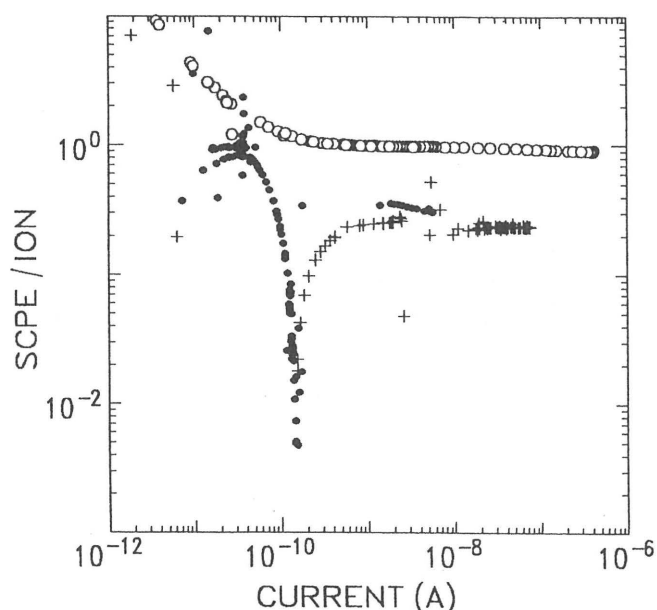


Fig. 1 Secondary charged particle emission per ion from $SrCeO_3$ (5%Yb): secondary electron emission (SEE) yields for 2.5 keV H^- (o), SEE yields for 2.5 keV H^+ (o) and secondary positive ion emission yield for 2.5 keV H^+ (+).

References

- [1] Particle Induced Electron Emission I & II, ed. G. Höhler(Springer-Verlag 1991).
- [2] E.W.Thomas, International Atomic Energy Agency, INDC(NDS)-322, IAEA, Vienna, Feb. 1995.