



XPS study on W-Ni and Steel surfaces

(NSU – Aichi Pref. Joint Research Program)

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1. Introduction

Recently, we have prepared amorphous W-Ni samples. High corrosion resistance has been obtained. However, the mechanism of high corrosion resistance has not been studied. In order to understand the mechanism, we have performed XPS to study the surface structure. Our results (as described below) has revealed that the surface is covered with an oxide thin layers of the order of 5-10 nm. The composition of the oxide layer was suggested to be NiWO₃. We have used sputtering to remove the surface of 5-10 nm. After the sputtering, the composition is expected as the composition of our starting material – Ni- 20w% W.

2. Experiment

Samples of a shape of plate have been used in this study. In order to study the surface structure, the original sample without any cleaning/sputtering process was taken for the first XPS scanning. After the scanning, samples were sputtered to remove a thin layer in the order of 5-10 nm. After the sputtering, the sample was scanned again. Apart of the original sample, other two samples after additional oxidation were also studied.

3. Results and Discussions

There is a high intensity peaks of oxygen in the as-prepared sample without sputtering. The results implied that the sample is covered with a layer of oxide. After a rough estimation, the composition of the oxide layer was suggested to be NiWO₃, very close to a stable oxide phase between NiO and WO₂. Certainly, a further confirmation is needed to be done. After the first XPS on the original surface, we used sputtering to remove the top surface of 5-10 nm. After sputtering, the XPS spectrum (as shown in Fig. 1) showed a nearly intermetallic composition of Ni-20wt% W, as expected from the starting materials. However, there was a very small peak of oxygen. A further study will be carried out to confirm the composition. Other samples after additional oxidation have shown similar results, indicating the stability of the original oxide layer. More detailed analysis will be done soon. In our future study, we plan to use EXAFS for a more detailed study.

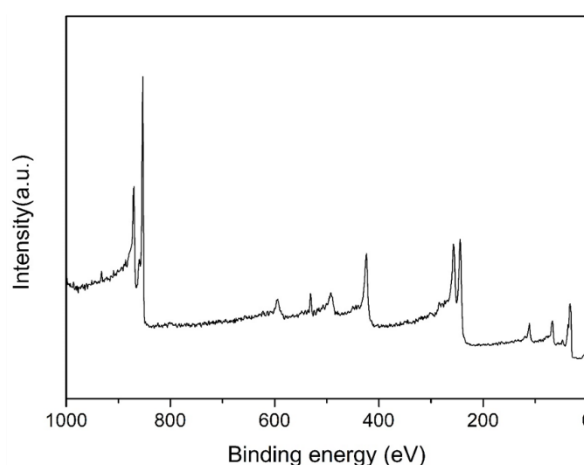


Fig. 1: XPS spectrum of Ni-W alloy

4. References

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