

Magnetic properties of anodically deposited manganese oxide

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Manganese oxides have been widely used for the electrode of battery and other fields of engineering. They are produced by the methods like as thermal decomposition [1], anodic deposition and sputtering. Manganese oxides produced by thermal decomposition have been studied for long periods. However, manganese oxides for the selective oxygen evolution electrode are produced by anodic deposition as well as thermal decomposition. [2-3] The properties of manganese oxide are affected by microstructure, crystal structure, thermal, electrical and magnetic properties.

The energy bands for manganese and manganese complex oxides were calculated for the several additive elements by the DV-X α method to improve the electrical conductivity of it. And then, manganese oxide and manganese-nickel oxide for the selective oxygen evolution electrode were produced by the anodic deposition which is controlled with the current density of 30mA/cm² at room temperature in 0.2M manganese sulfate solution and manganese-nickel sulfate solution (0.5%Ni).

Fig. 1 shows the results of calculated energy band for the additives in manganese oxide by DV-X α . As manganese oxide nickel-added in additives of Ti, Ni, Sn showed the lowest energy band gap, it is estimated that the good electrical and magnetic properties of manganese-nickel oxide were changed. In this study, the magnetic properties of manganese and manganese-nickel oxide were analyzed by VSM.

References

- [1] Ye. V. Kuz'minskii, A.A. Andriiko and N.I. Nyrkova, "Chemical and phase composition of manganese oxide obtained by Mn(II) oxidation in nitrate solutions", *J. Power Source*, 52, (1994) pp. 49-53
- [2] K. Izumiya, E. Akiyama, A. Kawashima, K. Asami and K. Hashimoto, "Surface activation of manganese oxide electrode for oxygen evolution in electrolysis of seawater", *J. Appl. Electrochem.*, 27, (1997) pp.1362-1368.
- [3] N. A. Abdel Ghany, N. Kumagai, S. Meguro, K. Asami and K. Hashimoto, "Oxygen evolution anodes composed of anodically deposited Mn-Mo-Fe oxides, for seawater electrolysis", *Electrochimica Acta*, 48, (2002) pp.21-28.

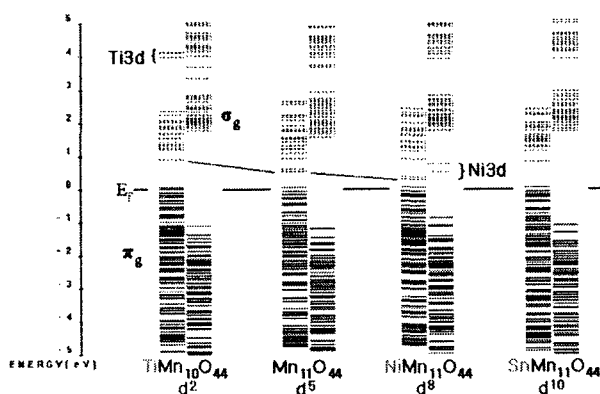


Fig. 1 Variable energy bands as function of additives