

Preparation of Pt-Ni Alloy Thin Films with Various Compositions by Sputtering and their Activity for Oxygen Reduction Reaction

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Pt-Ni alloy thin films with various compositions were prepared by RF-magnetron sputtering, then their activity was evaluated. By combining a circular plate and rectangular plate of Pt and Ni as the target, Pt-Ni alloy thin films with various compositions were obtained. Although the oxygen reduction current of the Pt film and Ni film were 4.8 mA cm^{-2} and 1.0 mA cm^{-2} , respectively, the oxygen reduction current of the Pt-Ni alloy thin film was higher than 5 mA cm^{-2} . Among the Pt-Ni alloys, Pt₇₂Ni₂₈ showed the highest oxygen reduction current of 7.2 mA cm^{-2} . These better activities of the Pt-Ni alloy thin films were caused by their higher active surface areas than that of the Pt thin film. It is postulated that the role of Ni increases the surface area by dissolution and inhibiting the oxidation of Pt. Especially, the Pt-Ni thin film with the Ni content higher than 90 at.% showed a higher oxygen reduction activity than Pt. Because the amount of Pt is able to be drastically reduced using the Pt-Ni alloy, it is a very promising material for the oxygen reduction reaction.

Keywords : PEFC, cathode catalyst, oxygen reduction reaction, Pt-Ni alloy, active surface area