

Preparation of Ni-Al Alloys at Reduced Temperature for Fuel Cell Applications

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Preparation of the Ni-Al alloy normally involves melting of nickel and aluminum at high temperature around 1400°C. Synthesis of Ni-Al alloy without melting of nickel and aluminum is more desirable to reduce the cost of alloy production. Previously, porous Ni-Al anodes have been prepared from mixtures of elemental powders at 1100–1200°C, but the temperature is still too high to reduce the cost of alloy preparation significantly. The purpose of this study is to investigate the Ni-Al alloy formation below the melting point of aluminum (660°C). To this end, aluminum chloride (AlCl_3) is adopted as an activator for the formation of Ni-Al alloy powders. When mixtures of aluminum and nickel powders are exposed to AlCl_3 vapor, aluminum in the mixtures can react with AlCl_3 to produce AlCl and AlCl_2 , which react with nickel to form Ni-Al deposits on the nickel surface. In this study, we have prepared Ni-Al alloy powders from a mixture of Ni and Al elemental powders using AlCl_3 as an activator. The effect of reaction temperatures on alloy formation has been thoroughly investigated. In addition, oxidation behavior of the Ni-Al alloy powders was examined.