

Investigation of metal alloy and metal alloy suspension catalyst for hydrogen release from NaBH_4 for PEMFC application

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Sodium borohydride (NaBH_4) is a promising candidate for hydrogen storage materials as a hydrogen carrier for portable fuel cell systems. In order to reduce volume and cost of the hydrogen generation system, high-performance catalyst which contains less precious metal is required. In this present investigation, a number of metal alloy compositions have been evaluated by high throughput screening (HTS) test. Among the binary catalyst tried, $\text{Ru}_{80}\text{Fe}_{20}$ suspension exhibited a highest activity, which is around 275% higher than the Ru/Co alone. In the case of tertiary alloy suspension, the hydrogen release rate is highest in the Ru-Co-Fe alloy when compared with the binary metal alloy composition (Ru-Co or Ru-Fe). In the case of ACF supported ruthenium catalyst, the reduction process plays an important role in both the particle size of the formed catalyst and consequent enhancement of hydrogen release rate. The prepared catalysts were analyzed by XRD and XPS spectra, which indicate the presence of alloy consisted of ruthenium, cobalt and iron. The suitability of the catalyst in the real PEM Fuel cell application has been examined and it shows the applicability in field applications.