CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A system of $LiNH_2/LiAlH_4/MgH_2$ was investigated for its hydrogen storage capacity and reversibility. $LiNH_2$ was modified by adding with $LiAlH_4$ and MgH_2 to suppress the NH_3 emission from $LiNH_2$. Moreover, Ti and Ti compounds (TiO_2 and $TiCl_3$) were used to enhance the hydrogen capacity of the hydrogen storage material and improve the reversibility of the hydrides. The results showed that adding $LiAlH_4$ or MgH_2 in $LiNH_2$ led to the decrease in the desorption temperature and increase in the hydrogen capacity up to 3.1 wt% and 3.6 wt%, respectively. The hydrogen re-absorption capacity was also possible-0.8 wt% for 2:1 $LiNH_2/LiAlH_4$ and 2.3 wt% for 2:1 $LiNH_2/LiAlH_4$. Moreover, the NH_3 emission was suppressed by MgH_2 and $LiAlH_4$. However, a small amount of NH_3 emission and the lower temperature of the emission was obtained. Mixing $LiNH_2$ with $LiAlH_4$ and MgH_2 (2:1:1 $LiNH_2/LiAlH_4/MgH_2$) suppressed the NH_3 emission from the decomposition reaction, destabilized the $LiNH_2$ by decreasing the onset desorption temperature of the hydride, and increased the hydrogen capacity up to 3.2 wt%. However, it was not reversible. Types of catalysts had an effect on the amount of hydrogen desorption/absorption. The mixture of 2:1:1 $LiNH_2/LiAlH_4/MgH_2$ doped with 5 mol%TiO_2 provided a higher hydrogen capacity with 3.7 wt%, followed by doped with $TiCl_3$ and Ti with hydrogen capacity 3.3 wt% and 3.0 wt%, respectively. The mixture of 2:1:1 $LiNH_2/LiAlH_4/MgH_2$ doped with 5 mol%Ti gave the best performance in the reversibility, which re-absorbed hydrogen about 0.38 wt%, followed by doped with $TiCl_3$ and TiO_2. In addition, carbon nanotube was added in 2:1:1 $LiNH_2/LiAlH_4/MgH_2$ to improve the hydrogen re-absorption capacity in the mixture. The mixture of 2:1:1 $LiNH_2/LiAlH_4/MgH_2$ added with 10 wt% carbon nanotube had higher performance in the reversibility than that added with 5 wt% carbon nanotube, 0.7 wt% and 0.5 wt%, respectively. This result implied the higher the surface area, the higher the hydrogen re-absorbed.

5.2 Recommendations

Because all samples were prepared in the glove box, which was purified with nitrogen gas; therefore, the accuracy of sample weight in the jar was difficult to maintain. Moreover, the samples usually sticked on the wall of the beaker, which undermined the experimental results inaccuracy. An adequate amount of sample should be used to compensate all possible errors and the sample loading must be carefully performed in order to reduce errors.

A reading pressure value could be expressed with higher resolution by using higher bit of computer processing unit (CPU) in AI module 210 data logger (A/D).

The operating condition especially the temperature has an affect on the displayed pressure. As a result, the adsorption condition should be operated at a constant temperature in order to enhance the pressure precision.

The ratio of ball to powder affects the homogeneity of the mixture, which is important for the hydrogen desorption/absorption. Therefore, the milling process should be used with consistent ratio of the ball to powder.