CHAPTER V
CONCLUSIONS

In this thesis, reversibility of $LiBH_4$ and $LiAlH_4$ (or Li_3AlH_6) in LB-LA composite was improved by ball milling of dehydrogenated LB-LA quenched at 220 °C (LB-LA (220)). This resulted in particle size reduction and good dispersion of all species, especially metallic Al and effective formation of AlB_2 and LiAl upon dehydrogenation. In addition, MWCNTs enhancing hydrogen diffusion and thermal conductivity for de/rehydrogenation were doped into LB-LA (220) to obtain LB-LA (220)-CNT. The LB-LA showed two-step decomposition of $LiAlH_4$ and $LiBH_4$ together with storage capacities of ~4.0 and 2.2 wt. % H_2, respectively, while LB-LA (220) and LB-LA (220)-CNT revealed only decomposition of $LiBH_4$ with 2.7-3.0 wt. % H_2. With respect to LB-LA, reduction of onset temperature (ΔT= 120 °C) and rapid kinetics (~three times) during dehydrogenation of the thermally stable phase of $LiBH_4$ were observed for LB-LA (220) and LB-LA (220)-CNT. Dehydrogenation of LB-LA proceeded through individual reactions of $LiAlH_4$ and $LiBH_4$ to produce Al, LiH, amorphous B, and $Li_2B_{12}H_{12}$ without any active species. For LB-LA (220) and LB-LA (220)-CNT, in addition to comparable phases with LBLA, the formation of AlB_2 (only LB-LA (220)) and LiAl suggested effective reaction of Al with molten $LiBH_4$ and LiH, respectively, due to high surface area and good distribution of Al. Owing to the formation of AlB_2 and LiAl, reversibility of $LiBH_4$, $LiAlH_4$, and Li_3AlH_6 was found in LB-LA (220), but LB-LA (220)-CNT showed only reversibility of $LiBH_4$. This might be explained by the fact that contact between Al and other phases was obstructed by dispersion of MWCNTs in hydride matrices, leading to deficient formation of active species for reversibility.