CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effect of feed compositions on the *m*- and *p*-CNB crystallization was observed by using the feeds with 61.0, 62.9, and 65.0 wt% *m*-CNB. The crystallization from the eutectic composition results in opaque precipitates with the CNB composition close to that of the feed at 23.5°C. The precipitates from the feed above the eutectic composition appear in a transparent form and their compositions are rich in *m*-CNB, 92.73 wt%, while the feed composition below the eutectic composition provides the *p*-CNB enriched-precipitates, 95.04 wt%. A possible reason why the precipitate composition is not close to 100% may be from the contamination in the feed. The study on the effect of adding a zeolite (NaX, CaX, BaX, NaY, and CaY) on the *m*- and *p*-CNB crystallization shows that the presence of the zeolites does not affect the feed solution composition but has a great influence on the precipitate composition. In the feed at the eutectic composition, the amorphous precipitates become crystal precipitates with the composition being rich in *p*-CNB. The precipitate composition from the feed above the eutectic composition is shifted from being rich in *m*-CNB to rich in *p*-CNB, while the composition still remains rich in *p*-CNB for the precipitates from the feed below the eutectic composition. The cation, type of the zeolite, and the position of the precipitates have a significant effect on the precipitate composition in the feed below the eutectic composition more than those in the feed at and above the eutectic composition. For the precipitates in the feed below the eutectic composition, BaX provides the lowest *m*-/*p*-CNB ratio or the highest *p*-CNB composition, 91.38 wt%. On the other hand, NaY offers the highest *p*-CNB composition, when the feeds at and above the eutectic composition are used, 89.52 wt% and 90.16 wt%, respectively. Furthermore, to prove why the precipitate composition is shifted from *m*-CNB to *p*-CNB, the effect of temperature variation, zeolite selectivity, and adsorbent structure and surface area were investigated. From the result, there is no temperature variation in the solution during the experiment, while the zeolite selectivity, type of adsorbent and adsorbent

structure have a great influence on the change as increase or decrease in the CNB precipitate composition. However, the reason for the shift in the composition from *m*-CNB to *p*-CNB in the precipitates has to be further investigated.

5.2 Recommendations

Based on what has been discovered in this study, the following recommendations are suggested:

1) The crystal size distribution and purity of the precipitates should be considered.
2) The characterization of the adsorbents before and after the experiment should be investigated to examine the change in adsorbent structure.
3) The suspension crystallization should be applied to decrease the operation time.