

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effects of the KY zeolite, BaX zeolite, NaX zeolite, activated carbon, and silica gel on the binary phase diagram of *m*- and *p*-CNB were constructed to study the effects of feed compositions on the *m*- and *p*-CNB crystallization. The crystallization with the addition of KY zeolite clearly results in the crystal formation, not the amorphous solid as in the case, where this is no zeolite. The eutectic composition is 65.5 wt% *m*-CNB, which is about 3 wt% *m*-CNB higher in the *m*-CNB composition than the amorphous solid composition, 62.9 wt% *m*-CNB, from the system without the zeolite. In addition, the new eutectic temperature is about 4 °C lower, 18.5 °C compared to 22.9 °C.

NaX zeolite is then chosen for the study as the zeolite has high *m*-CNB selectivity than the KY and BaX zeolites. It can be seen that the presence of the NaX zeolite results in about the same affects as the KY and BaX zeolites despite its high *m*-CNB selectivity. Other than that, there is no significant difference between the system with the KY and BaX zeolites. Activated carbon and silica gel were selected because of their low *m*-CNB selectivity. It can be seen that the eutectic temperature is 16.5 °C, which is lower than the one without the activated carbon. The activated carbon has about the same effect on the eutectic temperature as the zeolites. The eutectic temperature is about 5.0 °C lower than that without the silica gel. The same behavior can also be observed when the KY zeolite is changed to other zeolites, BaX and NaX zeolites, or amorphous materials, activated carbon and silica gel. For *m*-CNB selectivity or even type of solid material in the CNB mixture, the presence of a solid material has more and less the same behavior. It may be explained that the added materials may act as impurity in the form of seeding and change the boundary between the stable zone and metastable zone.

5.2 Recommendations

Based on what has been discovered in this study, further study on the crystallization behavior of the feed with the eutectic composition and factors that can influence the final crystalline product should be studied.