CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In this research, zeolite A was successfully synthesized using various types of local clays, including ball clay, Ranong white clay, and Lampang white clay, to determine the most suitable raw material for zeolite formation. The results revealed that ball clay, with a Si/Al ratio of 1.32, exhibited the most appropriate composition for zeolite A synthesis. In general, starting materials for synthesizing zeolite A should ideally possess a Si/Al ratio in the range of approximately 1.00 - 1.30 to ensure proper framework formation and phase purity. The composition of ball clay closely matched this optimal range, making it a promising raw material for zeolite A production. Ball clay was calcined at different temperatures ranging from 400°C to 800°C for 3 hours. It was found that at 600°C, the XRD pattern exhibited a kaolinite peak, indicating the transformation into a metastable phase of ball clay, which is favorable for zeolite formation. Zeolite A was successfully synthesized from ball clay at a NaOH concentration of 3 M. Furthermore, ion exchange between Na^+ and Li^+ ions was achieved using a 2 M LiOH solution, confirmed by FTIR analysis, indicating the successful formation of Li-zeolite. The synthesized zeolite was formed into particles using a spray drying method without the need for a binder, which simplified the shaping process and maintained the material's purity. Performance testing of zeolite with different particle sizes (450, 550, and 650 μm) in an oxygen concentrator demonstrated that the 450 μm zeolite particles provided the highest oxygen purity, reaching 93 percent after 15 min of operation. This result indicates that smaller particle sizes enhance the adsorption efficiency and improve the overall performance of the oxygen concentrator. Overall, this study confirms that locally sourced ball clay is a suitable and sustainable raw material for synthesizing Li-A zeolite, which can be applied effectively in oxygen concentrator systems.

5.2 Recommendation

5.2.1 Ion Exchange Exploration:

Additional studies using different cations, such as Ca^{2+}, Mg^{2+}, and K^{+}, may be conducted to evaluate their impact on adsorption performance and selectivity in oxygen concentrator applications.

5.2.2 Long-term Performance Testing:

Extended operational testing of Li-A zeolite in real oxygen concentrators should be conducted to assess its stability, regeneration behavior, and performance over multiple adsorption cycles.

5.2.3 Scale-up and Economic Feasibility:

A techno-economic assessment should be performed to evaluate the cost-effectiveness of large-scale Li-A zeolite synthesis from ball clay and its potential for industry application.