CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The experimental measurement of diffusivity of CO_2 in Lan Krabue Crude has been done by using the MATLAB mathematical analysis following Zhang *et al.* (2000). From the experiment, when carbon dioxide diffuses into crude oil, found that the viscosity of crude oil was decreased dramatically. The diffusion coefficient of carbon dioxide into crude oil increased with increasing the initial pressure and temperature. Moreover, the diffusion coefficient increased with the increase of API gravity.

5.2 Recommendations

The diffusion coefficient that obtained from this work is a primary data which could be applied to calculate the viscosity of crude.

Improvement of investigation of diffusion coefficient should be considered for the effect of impurity of injected gas i.e. pure carbon dioxide, mixed carbon dioxide with nitrogen and CH_4 because in reality, the petroleum reservoir consisted of light and heavy components. Light components could be vaporized to mix with injected carbon dioxide and affect the system in the positive direction.

The experiment cannot be tested at high pressure or close to reservoir condition with this equipment because the lack of syringe pump (high pressure pump). So the prediction of the diffusion coefficient at the high pressure could be done by extrapolating the data at higher pressure. Thus, more information or more data points of diffusion coefficient at various pressures are needed to make the correlation.

The effect of dynamics diffusion on the diffusion coefficient should be performed by stirring the petroleum crude with various speeds of stirrer in order to compare with static diffusion because the convective mass transfer is the one of parameters.

For this method, stirrer needs to be installed to set the system as a dynamic diffusion. The speed of stirrer should be observed because there are 2 diffusion directions: axial direction (from the interface of crude to bottom end) and radial direction (from shaft of stirrer to wall) affected by the magnitude of stirrer speed. According to Zhang *et al.* (2000), the static diffusion coefficient equation was driven under simplified assumption:

(i) Swelling of liquid phase is negligible; Z_0 is constant during the test.

(ii) No resistance to mass transfer at the gas-liquid interface, i.e., the concentration at the interface is the equilibrium concentration.

(iii) Temperature is constant during the test.

(iv) The oil is non-volatile liquid.

(v) The gas phase is single component (pure gas).

This diffusion coefficient equation cannot be modified by adding any parameters to calculate the dynamic diffusion coefficient. Therefore, the new correlation is needed.