CHAPTER III
EXPERIMANTAL

3.1 Materials and Equipment

The ultra-high purity grade of carbon dioxide that supplied by Praxair (Thailand) Company Limited was use as diffused gas into Lan Krabue crude, API 14.1 and 21.3, which supplied by PTT Exploration and Production Public Company Limited (Thailand). Diffusion coefficient of carbon dioxide into Lan Krabue crude was carried out by using Parr reactor model 4576A high temperature/high pressure (Parr Instrument Company, USA) and temperature was controlled by reactor controller model 4848, which was purchased from Parr Instrument Company, USA. Inlet pressure was controlled by pressure regulator (brass, model YR-303, Morris Engineering Work LTD, Taiwan). Back pressure regulator (SS-316, Swagelok, USA) was connected to the reactor to limit the pressure in the reactor as needed.

3.1.1 Experimental Setup

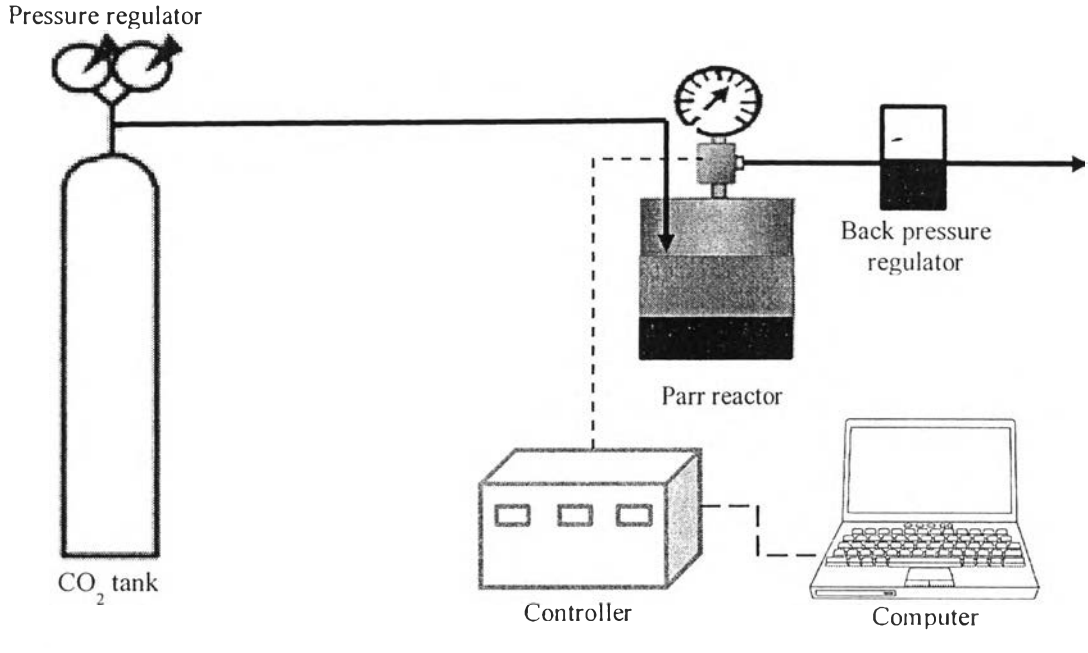

Fig. 3.1 Schematic diagram of measurement of pressure decay.

In Fig. 3.1, diffusion coefficient of carbon dioxide in Lan Krabue crude was monitoring pressure in a Parr reactor. CO_2 from the gas tank is connected to the reactor and its initial pressure loaded into the reactor is controlled by the pressure regulator. Back pressure regulator was connected to the reactor to limit the pressure in the reactor as needed. Controller was connected to the reactor to control temperature and measured the pressure in the reactor. Moreover, computer was connected to the controller to record pressure and temperature every 1 hour.

3.2 Experiment Procedure

3.2.1 Measurement of Pressure Decay

3.2.1.1 Lan Krabue Crude and Carbon Dioxide Loading

Lan Krabue crude was loaded into the reactor vessel to obtain crude at desired height about 3.1 cm. (approximate volume 100 mL) and heat to the desired temperature (30 and 40 °C).

CO_2 was allowed to flow into the reactor from the top with slow rate until the pressure in the reactor reached the desired pressure (300 and 700 psi) by controlling the equal feed time of carbon dioxide of each experiment (less than 1 minute) to minimize the feeding time error that could effect on diffusion coefficient. Then, the Parr reactor was isolated and the test began. As time elapsed, the gas diffuses into the oil and pressure tends to drop very slowly in the gas space. Gas diffusivity was determined from the recorded pressure data with time passed.

3.2.2 Determination of Diffusion Coefficients of CO_2 in Lan Krabue Crude by Pressure Decay Method

The recorded pressures during the test were plotted against time elapse and then, the experimental data were put into MATLAB to fitting curve with a non-linear regression function and to get the constant value of b and then, to calculate the constant value of k_1 in Zhang *et al* equation, and finally the diffusion coefficient of CO_2 in the Lan Krabue crude.