CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The batch dissolution experiments of analcime in HCl, in citric acid and subsequent silicate precipitation were studied. The effects of temperature, concentration of acid and supersaturation ratio on both dissolution and precipitation were investigated. The conclusions drawn from the experimental result are as follows.

1) Analcime dissolution in HCl and in citric acid are non-stoichimetric and follows the Michaelis-Menten model at all temperatures.

2) The dissolution of analcime in citric acid appears to be a catalytic process at the solid- liquid interface.

3) Dissolution rate, precipitation rate and Si plateau height increases as the temperature is increased.

4) Decreasing the concentration of citric acid resulted in longer induction time, more dissolution of silicate from analcime particles, but a slower dissolution rate.

5) As supersaturation ratio is decreased, the induction time increases.

6) Dissolution rate in mixed citric acid and HCl is faster than in pure HCl and increase as the concentration of citric acid increase.

7) Citric acid is a potential candidate for an alternative acidizing stimulation fluid.

5.2 Recommendations

1) The influence of temperature, acid concentration and super saturation ratio on the silicate precipitation were discussed. However, there are circumstances under which the influence of temperature, acid concentration and super saturation ratio must be predicted prior to performing acidization treatments, requiring a detailed knowledge of silicate precipitation mechanism.

2) The influence of un-dissolved particles on the precipitation mechanism is important because, if the precipitation mechanism is heterogeneous the un-dissolved particle will provide nucleation site for precipitation. Moreover, un-dissolved particle can be migrate and block the pore by itself.

3) Typically, acidization treatments involve complex acid formulations, often consisting of hydrofluoric acid as well as other organic acids. Fundamental knowledge of dissolution and precipitation mechanism in these complex systems should be developed.

4) Since in the actual condition in olifield reservoirs is different form the experimental conditions, more experiment should be carried out at high temperature and pressure and in the presence of oil as well.

5) The assumption for interaction between analcime and citric acid in both solution and surface should be proof.

6) The use of other chelating agents such as phosphonates and catechol should be methodically examined.