CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Naturally available clinoptilolite was used to remove water from natural gas. Four modifications, thermal treatment, acid treatment, ion exchange, and acid treatment prior to ion exchange were studied for their effects on the water and hydrocarbons adsorption of clinoptilolite.

Characterization studies showed that all modification techniques at the studied condition did not affect the structure of the zeolite. However, drastic changes in the zeolite crystallinity were found for the zeolites treated with the thermal treatment and acid treatment. The calcination temperature above 300°C and the nitric acid concentration above 0.1 M led to the destruction of the crystal structure.

The investigation also showed that all modification techniques used did not affect the Si content of the zeolite. However, the cations and Al contents did alter with the acid treatment and acid treatment prior to ion exchange. Moreover, the higher acid concentration led to a higher extent of dealumination.

The major factor on hydrocarbons and water adsorption is the Si/Al ratio. While the thermal treatment and ion exchange did not improve the water adsorption capacity, the acid treatment and acid treatment prior to ion exchange increased the clinoptilolite porosity and adsorption capacity for water and pentane.

The molecular weight and the affinity of molecules played an important role in the dynamic hydrocarbons and water adsorption of clinoptilolite. All adsorbed hydrocarbons were replaced by water, while possesses high affinity. It indicates that clinoptilolite preferentially adsorbs water to the hydrocarbons. Acid-Na-clino is a promising adsorbent for water

removal from natural gas as it has the highest water adsorption capacity of 0.1004 g adsorbed water/g clinoptilolite.

Other natural zeolites should be investigated as an adsorbent for water removal from natural gas.