CHAPTER V
CONCLUSIONS
CONCLUSIONS

From the results obtained and discussion in the previous chapter, following conclusions have been drawn.

1. The gasification rate of all the four non-coking coals increases with increase in temperature. This increase in reactivity corresponds to endothermic Boudourd reaction.

2. The gasification rate of char decreases with increase in char preparation temperature for all the four coals.

3. The gasification of char with CO$_2$ followed a Shrinking core model in the temperature range 900 to 1050$^\circ$C for all the four coals.

4. The values of the activation energy for gasification of all the four coals are in the range of 111.2-147.2 kJ/mole.

5. The activation energy increases and reactivity index decreases with increase in char preparation temperature. This may correspond to decrease in heteroatoms and structural ordering of the coal matrix due to high char preparation temperature.

6. Reactivity and kinetic data from thermo-gravimetric analysis of char-CO$_2$ gasification has been used to understand gasification performance of coal in actual gasifier.

7. Laboratory data have been scaled up to pilot plant level fluidized bed gasifier of capacity 10-20 kg/h coal feed rate and the data generated has been used to derive various correlations.
8. Four correlations have been developed to predict gasification performance parameters like CO+H₂, product gas generation, product gas heating value and carbon conversion considering physico-chemical properties of coal and process parameters as an input. Magnitude of correlation coefficient ($r$) for these correlations are 0.988178, 0.997252, 0.8847 and 0.98497 respectively. These correlations can be used in the prediction of gasification performance parameters for unknown coals. Soundness of such correlations can be strengthened through numerous data with a wide range of non-coking coals.

The impact of the present work is concurrently significant not only in finding kinetic data of different Indian coals, but also, it is very much relevant in the utilization of waste CO₂ from flue gases as a gasifying agent. Thus, it will help in CO₂ sequestration.
SUGGESTIONS FOR FUTURE WORK

1. Thorough investigation on gasification of non-coking coal from different coal-fields is needed at higher capacity to get scale up data.
2. Studies on advanced gas cleanup is needed to increase gasification efficiency.
3. The utility of the product gas should be explored, so that the product gas composition can be adjusted accordingly.
4. Studies on CO₂ recycle and utilization are required at higher capacity.