CHAPTER III

Theoretical Considerations
3.1 Mass transfer resistances

The following steps are involved in the heterogeneous gas-solid catalyzed reaction system:

1) Mass transfer (diffusion) of reactants from the bulk gas phase to the catalyst surface.
2) Diffusion of reactants through catalyst pores (Intra-particle diffusion).
3) Chemical reaction at the active sites.
4) Diffusion of products through catalyst pores to the surface.
5) Diffusion of products from the catalyst surface into the bulk gas phase.

Fig. 3.1 is a pictorial representation of these steps. Steps 1, 2, 4 and 5 are mass transfer processes. Any of these processes, whether internal or external, can influence the rates of reaction. To determine the kinetic parameters, it is essential to ensure the absence of mass transfer limitations. In the kinetically controlled reaction regime, the conversion of the reactant should not depend on the total gas flow rate for a fixed value of the space time.
Figure 3.1: Schematic diagram representing mass transfer limitation