

Table 2.3.1-1 (continued)

<i>Kinetic Groups</i>				
Adsorption of A controlling				k_A
Adsorption of B controlling				k_B
Desorption of R controlling				$k_R K$
Adsorption of A controlling with dissociation				k_A
Impact of A controlling				$k_A K_B$
Homogeneous reaction controlling				k

<i>Surface Reaction Controlling</i>				
	$A \rightleftharpoons R$	$A \rightleftharpoons R + S$	$A + B \rightleftharpoons R$	$A + B \rightleftharpoons R + S$
Without dissociation	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A K_B$	$k_{sr} K_A K_B$
With dissociation of A	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A K_B$	$k_{sr} K_A K_B$
B not adsorbed	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A$
B not adsorbed, A dissociated	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A$	$k_{sr} K_A$

<i>Exponents of Adsorption Groups</i>				
Adsorption of A controlling without dissociation				$n = 1$
Desorption of R controlling				$n = 1$
Adsorption of A controlling with dissociation				$n = 2$
Impact of A without dissociation $A + B \rightleftharpoons R$				$n = 1$
Impact of A without dissociation $A + B \rightleftharpoons R + S$				$n = 2$
Homogeneous reaction				$n = 0$

<i>Surface Reaction Controlling</i>				
	$A \rightleftharpoons R$	$A \rightleftharpoons R + S$	$A + B \rightleftharpoons R$	$A + B \rightleftharpoons R + S$
No dissociation of A	1	2	2	2
Dissociation of A	2	2	3	3
Dissociation of A (B not adsorbed)	2	2	2	2
No dissociation of A (B not adsorbed)	1	2	1	2

*From Yang and Hougen (1950).

Table 2.3.1-1
GROUPS IN KINETIC EQUATIONS FOR REACTIONS ON SOLID CATALYSTS^a

Reaction	Driving-Force Groups			
	$A \rightleftharpoons R$	$A \rightleftharpoons R + S$	$A + B \rightleftharpoons R$	$A + B \rightleftharpoons R + S$
Adsorption of A controlling	$p_A - \frac{p_R}{K}$	$p_A - \frac{p_R p_S}{K}$	$p_A - \frac{p_R}{K p_B}$	$p_A - \frac{p_R p_S}{K p_B}$
Adsorption of B controlling	0	0	$p_B - \frac{p_R}{K p_A}$	$p_B - \frac{p_R p_S}{K p_A}$
Desorption of R controlling	$p_A - \frac{p_R}{K}$	$\frac{p_A}{p_S} - \frac{p_R}{K}$	$p_A p_B - \frac{p_R}{K}$	$\frac{p_A p_B}{p_S} - \frac{p_R}{K}$
Surface reaction controlling	$p_A - \frac{p_R}{K}$	$p_A - \frac{p_R p_S}{K}$	$p_A p_B - \frac{p_R}{K}$	$p_A p_B - \frac{p_R p_S}{K}$
Impact of A controlling (A not adsorbed)	0	0	$p_A p_B - \frac{p_R}{K}$	$p_A p_B - \frac{p_R p_S}{K}$
Homogeneous reaction controlling	$p_A - \frac{p_R}{K}$	$p_A - \frac{p_R p_S}{K}$	$p_A p_B - \frac{p_R}{K}$	$p_A p_B - \frac{p_R p_S}{K}$

Replacements in the General Adsorption Groups ($1 + K_A p_A + K_B p_B + K_R p_R + K_S p_S + K_p$) ⁿ				
Reaction	$A \rightleftharpoons R$	$A \rightleftharpoons R + S$	$A + B \rightleftharpoons R$	$A + B \rightleftharpoons R + S$
Where adsorption of A is rate controlling, replace $K_A p_A$ by	$\frac{K_A p_R}{K}$	$\frac{K_A p_R p_S}{K}$	$\frac{K_A p_R}{K p_B}$	$\frac{K_A p_R p_S}{K p_B}$
Where adsorption of B is rate controlling, replace $K_B p_B$ by	0	0	$\frac{K_B p_R}{K p_A}$	$\frac{K_B p_R p_S}{K p_A}$
Where desorption of R is rate controlling, replace $K_R p_R$ by	$K K_R p_A$	$K K_R \frac{p_A}{p_S}$	$K K_R p_A p_B$	$K K_R \frac{p_A p_B}{p_S}$
Where adsorption of A is rate controlling with dissociation of A, replace $K_A p_A$ by	$\sqrt{\frac{K_A p_R}{K}}$	$\sqrt{\frac{K_A p_R p_S}{K}}$	$\sqrt{\frac{K_A p_R}{K p_B}}$	$\sqrt{\frac{K_A p_R p_S}{K p_B}}$
Where equilibrium adsorption of A takes place with dissociation of A, replace $K_A p_A$ by (and similarly for other components adsorbed with dissociation)	$\sqrt{K_A p_A}$	$\sqrt{K_A p_A}$	$\sqrt{K_A p_A}$	$\sqrt{K_A p_A}$
Where A is not adsorbed, replace $K_A p_A$ by (and similarly for other components that are not adsorbed)	0	0	0	0