

# THE KINETIC AND MECHANISTIC INVESTIGATION OF L – PHENYLALANINE BY N – BROMOACETAMIDE IN PRESENCE OF Pd(II) CATALYST IN ACIDIC MEDIUM

*Ashutosh Kumar*

*Department of Chemistry, S.B.P.G College, Baragaon, Varanasi , India.*

## **Abstract:-**

*The kinetic investigation of Pd (II) catalyzed oxidation of L – phenylalanine by N – bromoacetamide (NBA) in HClO<sub>4</sub> in presence of mercuric acetate as a bromide ion scavenger have been carried out . The reaction follows a first order kinetics with respects with respect to each N – bromoacetamide, L – Phenylalanine and Pd (II). While a negative effect was observed in [H<sup>+</sup>] and [Cl<sup>-</sup>] variation. The influence of mercuric acetate and ionic strength is insignificant. A suitable mechanistic steps in conformity with the kinetic observation is proposed.*

## **Introduction**

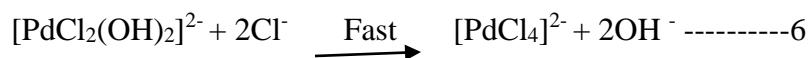
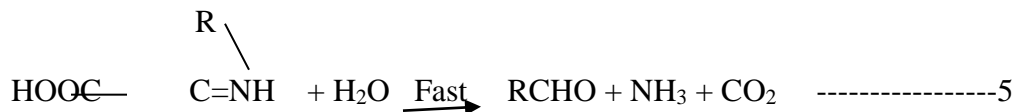
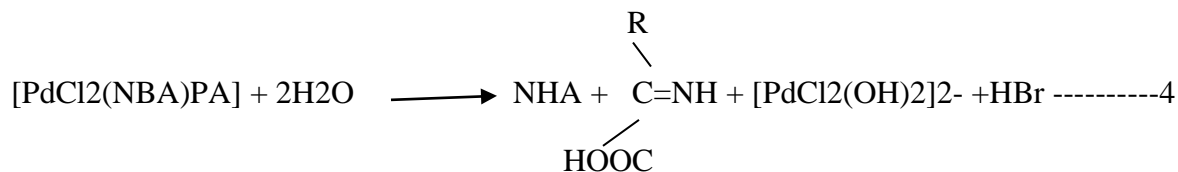
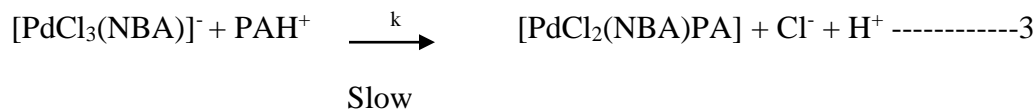
The kinetics of redox reactions catalyzed by certain transition – metal ions viz. Os(VIII) , <sup>1</sup> Ru(III), <sup>2-4</sup> and Ir (III)<sup>5-6</sup> as homogenous catalyst have been extensively investigated several papers have been devoted to the kinetics and mechanism of uncatalysed oxidation of alcohols <sup>7</sup> , Ketones<sup>8-9</sup> and DMSO<sup>10</sup> by NBA which has been earlier used as halogenating and oxidizing agent in estimation of several compounds. Although some work has been reported taking Pd(II) as catalyst in alkaline medium <sup>11-12</sup>. So far, no one has attempted to probe the role of Pd(II) chloride in oxidation of L-phenylalanine by N-bromoacetamide. Therefore in present paper an attempt has been made to investigate the kinetic and mechanistic studies of Pd(II) catalysis in N-bromoacetamide oxidation of L-phenylalanine.

## **Experimental**

### **Material & Method:-**

N- Bromoacetamide (S.Merck,Germany )and amino acid (E.Merck) were used as supplied. Pd (II) chloride solution was prepared by dissolving 1.0g of sample (Johnson & Mathey) in 500mL of 0.1M HCL and then diluted it hundred times. All other reagents such as HClO<sub>4</sub>, Hg(0 Ac)<sub>2</sub> , KCl, NaClO<sub>4</sub> were prepared in doubly distilled water. Aqueous solution of NBA was prepared afresh each day by direct weighing and its strength was checked by iodometric titrations of active bromine. HClO<sub>4</sub> was used as a source of H<sup>+</sup> ion.





Considering above mechanistic steps (1- 3) the rate law given in terms of loss of [NBA] as by equation (a).

$$\frac{-d[\text{NBA}]}{dt} = \frac{k \cdot K_1 K_2 [\text{NBA}] [\text{L-Phenylalanine}] [\text{Pd(II)}]}{K_1 [\text{Cl}^-] + [\text{H}^+] [\text{Cl}^-] + K_1 K_2 [\text{Pd(II)}]}$$

At constant [Pd(II)]

$$\frac{-d[\text{NBA}]}{dt} = \frac{k \cdot K_1 K_2 [\text{NBA}] [\text{L-Phenylalanine}] [\text{Pd(II)}]}{K_1 [\text{Cl}^-] + [\text{H}^+] [\text{Cl}^-] + C} \text{-----}(a)$$

Where C=  $K_1 K_2 [\text{Pd(II)}]$  = Constant.

The rate law (a) obtained is in agreement with kinetic data, hence proposed mechanism is valid.

**Table 1 : Effect of variation of [NBA], [L - Phenylalanine] and [Pd(II)] on the rate constant**

.

**[KCl] = 4.00X10<sup>-4</sup>M, Hg(OAC)<sub>2</sub> = 3.34X10<sup>-3</sup>M, Ionic strength = 2.00X10<sup>-2</sup>M**

**Temp = 35<sup>0</sup>C**

NBAX10 <sup>4</sup> M	L Phenylalanine X 10 <sup>2</sup> M	Pd(II)X10 <sup>6</sup> M	[H <sup>+</sup> ]X10 <sup>2</sup> M	kX10 <sup>7</sup> .S <sup>-1</sup>
8.00	2.50	4.82	2.00	7.53
10.00	2.50	4.82	2.00	6.63
12.50	2.50	4.82	2.00	6.88
16.67	2.50	4.82	2.00	6.22
20.00	2.50	4.82	2.00	7.04
25.00	2.50	4.82	2.00	6.60
10.00	2.00	4.82	2.00	7.88
10.00	2.50	4.82	2.00	8.14
10.00	3.33	4.82	2.00	7.06
10.00	5.00	4.82	2.00	8.42
10.00	10.00	4.82	2.00	8.35
10.00	2.50	1.92	2.00	6.85
10.00	2.50	3.86	2.00	7.20
10.00	2.50	4.82	2.00	7.30
10.00	2.50	5.72	2.00	6.92
10.00	2.50	7.71	2.00	7.35

## Reference

1. B. Singh, B.B Singh and R.P Singh, *J.Inorg. Nacl. Chem*; 43, (1981) PP 1283
2. B. Singh, A.K Singh and D. Singh; *J.Mol.Catal* .48, (1988) PP 207
3. B. Singh, D. Singh and A.K Singh; *Intl.J.Chem Kinet*.20 (1988) 207
4. B. Singh, A.K Singh, N.B Singh and B.B.L Saxena, *Tetrahedron* 40(1984) 2503
5. Ashok K. Singh, Alka Srivastava, Ashutosh Kumar and Bharat Singh, *Trans. Met. Chem*, 18(1993) PP 427 – 430
6. Bharat Singh, Manju Singh, Preeti Bhatnagar and Ashutosh Kumar, *Oxidation communication* 17, No-1 (1994) PP 48 – 55
7. J. Mukherjee, K.K Banerji; *J.Org. Chem*. 46 (1981) PP 2323
8. Bharat Singh, A.K Samant, B.B.L Saxena: *Tetrahedron* 40 (1984) 3321
9. Bharat Singh, Rohit Srivastava: *Oxid. Commn*. 9(1986) 1
10. P.S Radhakrishna murthi, N.C Sahu; *Indian . J of Chem* . 20A (1981) 269
11. Ashutosh Kumar, Bhanu Pratap; *Asian Journal of chemistry* Vol.24 No.5 (2012) PP 2345- 2347
12. Ashutosh Kumar, Bhanu Pratap; *Asian Journal of Chemistry* Vol.24 No.5 (2012) PP 2348-2350