International Journal of Chemical Engineering Research.
ISSN 0975-6442 Volume 8, Number 1 (2016), pp. 39-45

http://www.ripublication.com

Study of Partition Coefficient, Strength, and Association of Phthallic Acid in Immiscible Liqiuids

Anis Ahmed Sheikh [a], Mohamad Asif [a], Mohammed Juned[b], Ummul Khair Asema [a]

[a] *Maulana Azad College of Arts, Science & Commerce, Aurangabad(M.S), India.*
[b] *Sandip Polytechnic, Nashik (M.S), India.*

Abstract

The aim of this research paper is to determine the partition coefficient, strength and association of phthallic acid in immiscible liquids. These parameters were determined by taking three pairs of immiscible liquids. During experiment we got an interesting property of phthallic acid when taken in n-butanol. The results indicates the ability of phthallic acid to associate in different liquids. This research paper also provides information about the behaviour of solute to enter or exit in different phases.

Keywords: Partition Co-efficient, Aqueous Phase, Organic Phase.

INTRODUCTION

The partition coefficient is the distribution of solute in two immiscible liquids. Earlier it was known as distribution ratio. The first study of partition coefficient was performed by Berthelot and Jungfleisch[01] and came to result that the ratio of concentration of solute is constant and does not depend on solvent volume. But Nernst[02] have proved that partition coefficient remains constant if single type of solute is used. It is the activity of solute to enter in organic phase or aqueous phase which is explained by Partition Law by taking benzoic acid in benzene and water, which explained that benzoic acid exist in dimeric[03] form.

$$K = \frac{\sqrt{\text{C org.}}}{\text{C aqs.}}$$

Where K= Constant
C_{org} = Concentration of solute in organic phase
C_{aqs} = Concentration of solute in aqueous phase

By taking above expression we have determined the partition coefficient of phthallic acid in three sets of immiscible liquids on the basis of solubilises of solutes [04]. Literature showed that it was difficult that to study the association and dissociation of solute when taken in different concentration .That problem we have studied in this work by taking different concentrations of phthallic acid and tabulated the results which obtained during experiments. The strengths of phthallic acids in different sets were determined by simple titration methods [05] which were feasible in our laboratory.

MATERIALS

Phthallic acid , Benzene ,Carbon Tetra Chloride , n-butanol, Sodium Hydroxide, Phenolphthalein, Titration Kit etc. All the chemicals were of Merck and SD-Fine brands.

Methods : In first set we took 0.5 ,1 , 1.5 and 2 gm of phthallic acid in four different reagent bottles and labelled them as A,B,C and D. After that we had added 50 ml of water and 50 ml of benzene to each bottle and shacked well for 30 minutes and allowed them for 10 minutes. Then we had separated organic and aqueous layer by separating funnel and aqueous layer was titrated against standard 0.1 N NaOH solution[06] .Then 10 ml of organic layer was also titrated against standard 0.1 N NaOH solution .The results so obtained are tabulated in table No.1

In a similar way we had performed the experiment by keeping water as a constant phase Carbon Tetra Chloride as organic phase and results so obtained are tabulated in table no.2.

Finally we had used n-batanol as organic phase and keeping water as aqueous phase and results obtained are tabulated in table no. 3.

RESULTS AND DISCUSSIONS

Set 1 Phthallic Acid in Benzene and Water.

Table No. 1

Phase: Organic Phase (Benzene)

Concentration of Phthallic Acid in gram	Normality (N)	Strength in gm/litre
0.5	0.007	0.5897
1.0	0.013	1.088
1.5	0.017	1.453
2.0	0.022	1.852

Phase: Aqueous Phase (Water)

Concentration of Phthallic Acid in gram	Normality (N)	Strength in gm/litre
0.5	0.084	6.997
1.0	0.105	8.721
1.5	0.115	9.365
2.0	0.121	11.042

Partition Coefficients (K)

$$K = \frac{\sqrt{\text{C org.}}}{\text{C aqs.}}$$

$K_1 = 0.11006$, $K_2 = 0.11960$, $K_3 = 0.12871$, $K_4 = 0.12924$

Table No. 2. Set 2 Phthallic Acid in CarbonTetra Chloride (CCl_4)and Water.

Table No. 2
Phase: Organic Phase (CCl_4)

Concentration of Phthallic Acid in gram	Normality (N)	Strength in gm/litre
0.5	0.084	6.977
1.0	0.088	7.309
1.5	0.101	8.389
2.0	0.117	9.718

Phase: Aqueous Phase (Water)

Concentration of Phthallic Acid in gram	Normality	Strength in gm/litre
0.5	0.028	2.375
1.0	0.031	3.578
1.5	0.033	4.827
2.0	0.037	5.329

Partition Coefficients (K)

$$K = \frac{\sqrt{\text{C org.}}}{\text{C aqs.}}$$

$K_1 = 2.5067$, $K_2 = 2.5210$, $K_3 = 2.54471$, $K_4 = 2.5710$

Table No.3
Set 3 Phthallic Acid in n-Butanol and Water. Table No.3
Phase: Organic Phase (n-Butanol)

Concentration of Phthallic Acid in gram	Normality (N)	Strength in gm/litre
0.5	0.061	5.066
1.0	0.132	10.964
1.5	0.198	16.446
2.0	0.253	21.015

Partition Coefficients (K)

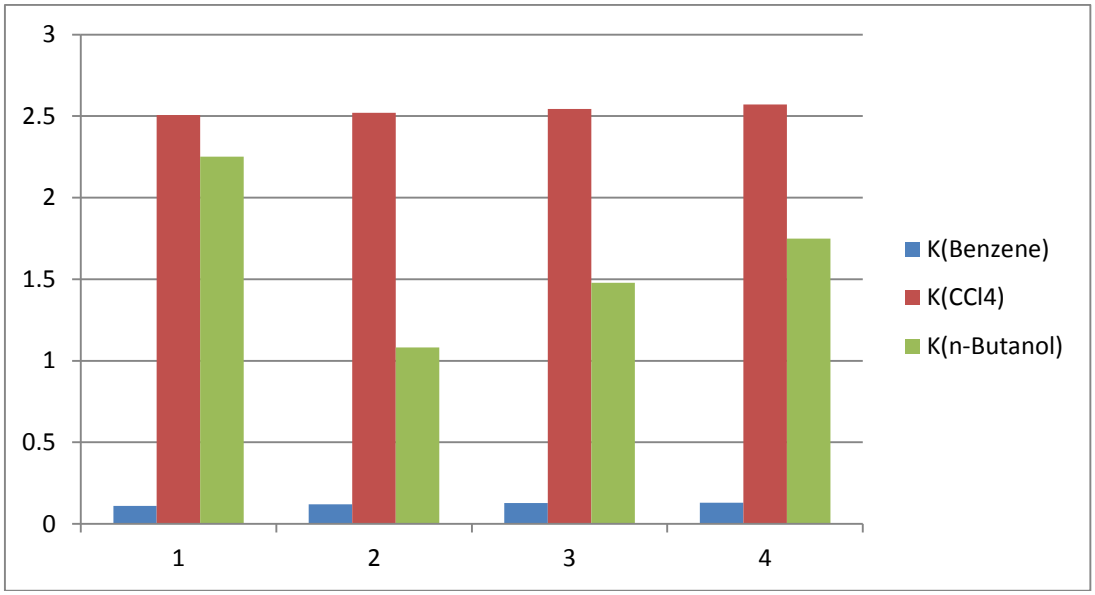
$$K = \frac{\sqrt{\text{C org.}}}{\text{C aqs.}}$$

$K_1 = 2.2509$, $K_2 = 1.0813$, $K_3 = 1.4786$, $K_4 = 1.7490$

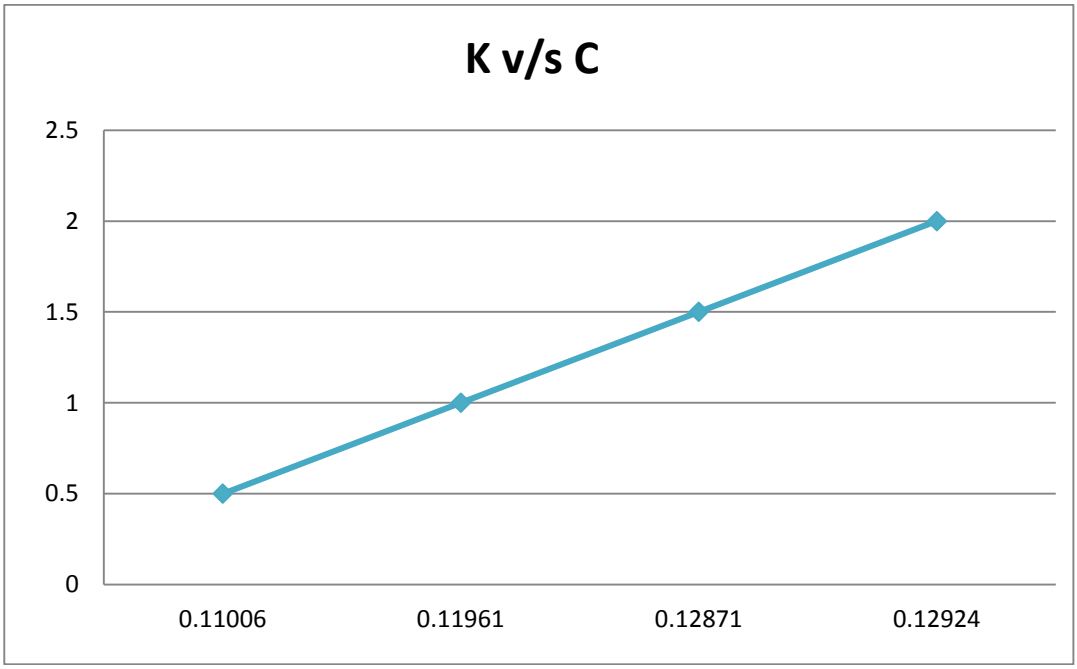
Comparison of Partition Coefficients (K) of Phthallic Acid in three Solvents i.e Benzene, Carbon Tetra Chloride and n-Butanol.

S. No.	K (Benzene)	K (Carbon Tetra Chloride)	K (n-Butanol)
1	0.11006	2.5067	2.2509
2	0.11961	2.5211	1.0813
3	0.12871	2.5447	1.4786
4	0.12924	2.571	1.7491

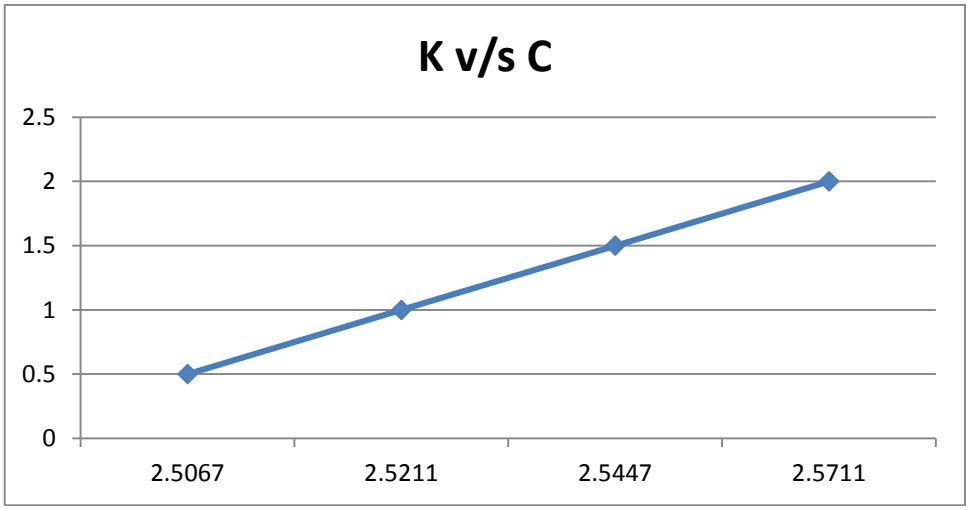
Comparison of Partition (K) Co-efficients in Benzene ,CCl_4 and n-Butanol in Graph[07]



The graphs of partition coefficient (K) versus concentration.
Partition coefficient (K) of Phthallic Acid in Benzene and water



Partition coefficient (K) of Phthallic Acid in CCl_4 and water



For PC of Phthallic Acid in n-Butanol and water the constant value obtained because there is no separation of two phases.

CONCLUSION

The partition coefficient of phthallic acid in benzene- water system and CCl_4 - water system showed that the property of solute does not depends upon volume of solutions[08] and as the concentration of solutes increases the ability of solute to enter in organic phase increases. The values of strength[09] for phthallic acid also showed that as the concentration of solute increases the strength also increases which is also independent to volume of solvent. Actually water and n-butanol are immiscible liquids but when phthallic acid is added in n-butanol and water mixture, the solubility[10] of n-butanol in water increases and system become single phase due to solute –solvent interaction.

REFERENCES

[1] Berthelot and Jungfleisch, *Ann.* Chim. Phys., 4,26 (1872).
[2] W. Nernst,Z.Phys. Chem., **8,** llO(1891).
[3] Systematic Experimental Physical Chemistry by Dr.S.W.Rajbhoj & Dr.T.K.Chondekar.
[4] B. Wroth and E. Reid, *ibid.*, 38,2316 (1916).
[5] A. Brandstrom, *Acta Chem. Scand.*, 17,1218 (1963).
[6] E. Overton, "Studien uber die Narkose," Fischer, Jena, Germany,1901.
[7] L. Craig, ***G.*** Hogeboom, F. Carpenter, and **V.** DuVigneaud, ***J.****Bid. Chem.***,** 168, 665 (1947).

[8] (119) J. H. Hildebrand and R. L. Scott, "The Solubility of Nonelectrolytes,"3rd ed, Reinhold, New York, N. *Y.*, 1950.

[9] E. Cohn and J. Edsal, "Proteins, Amino Acids and Peptides,"Reinhold, New York, N. Y., 1943, p *200.*

[10] **J.** Fogh, P. 0. H. Rasmussen, and K. Skadhauge, *Anal. Chem.*,26,392