International Journal of Advanced Research in Chemical Science (IJARCS)
Volume 2, Issue 4, April 2015, PP 22-24
ISSN 2349-039X (Print) & ISSN 2349-0403 (Online)
www.arcjournals.org

Synthesis of Mono-(4-Chlorothio) Phenyl Phosphate Ester and Its Characterization from IR Absorption Spectra

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Abstract: *Mono-4-chlorothiophenyl phosphate ester has been synthesized by Auger and Dupis method in a ratio of 1:1 thiol and $POCl_3$. The compound has been characterized by IR absorption spectra and elemental detection. The spectral study was conducted on KBr disc. IR spectra of mono-4-chlorothiophenyl phosphate ester clearly reveals different stretching frequencies of almost all the bonds present in the compound at their respective wave numbers.*

Keywords: *Mono-4-chlorothiophenyl phosphate, Auger and Dupis, absorption spectra, elemental detection, stretching.*

1. INTRODUCTION

An organophosphate refers to the ester of phosphoric acid. Phosphates are most probably the most prevalent organ phosphorus compounds. The chemistry of phosphate esters continues to draw the attention of chemists due to their versatile applications in the analytical[1,2], biological[3,4] and industrial fields[5,6].They are essentially the constituent components of DNA and protoplasm and play a vital role for the maintenance of life. Phosphates having C-S-P linkage are of great importance. They are used for antiviral activity[7], radioactive tracer techniques[8] for biological investigations, insecticidal activity[9] and textile commodities[10]. Due these multiple uses it is important to get knowledge about their stability and bond cleavage.

2. METHODOLOGY

The method of synthesis of phosphate ester (mono-4-chlorothiophenyl phosphate) has been illustrated as;

It is prepared by Auger and Dupis method in a ratio of 1:1 phenol and $POCI_3$. 6.52 g of 4-chlorothiophenol (A.R. grade) was dissolved in 20 ml of dry benzene; 3.66 ml of $POCI_3$ was taken in a conical flask and kept on a magnetic stirrer. Then a very small amount of the phenol (parent compound) was added slowly to $POCI_3$ and the material was stirred for a period of 6 hrs at 60 to 65°. After few minutes of each addition, 3 ml of pyridine was added to the stirred material in installments, pyridine hydrochloride began to separate at once with the evolution of heat. After the stirring is completed the stirred material was kept open so as to evaporate the solvent. Then the oily residue left in the flask was treated with water. The milky solution thus obtained was treated with diluted HCI to remove unreacted pyridine as pyridine hydrochloride. The solution was filtered off, first filtrate (very small amount) was rejected. To the clear filtrate Barium hydroxide was then added till it became alkaline and white precipitate began to separate. The precipitate was then washed several times with distilled water (containing few drops of acetic acid) to remove inorganic phosphate till dark color of phosphorus was obtained in the filtrate by Allen's test.

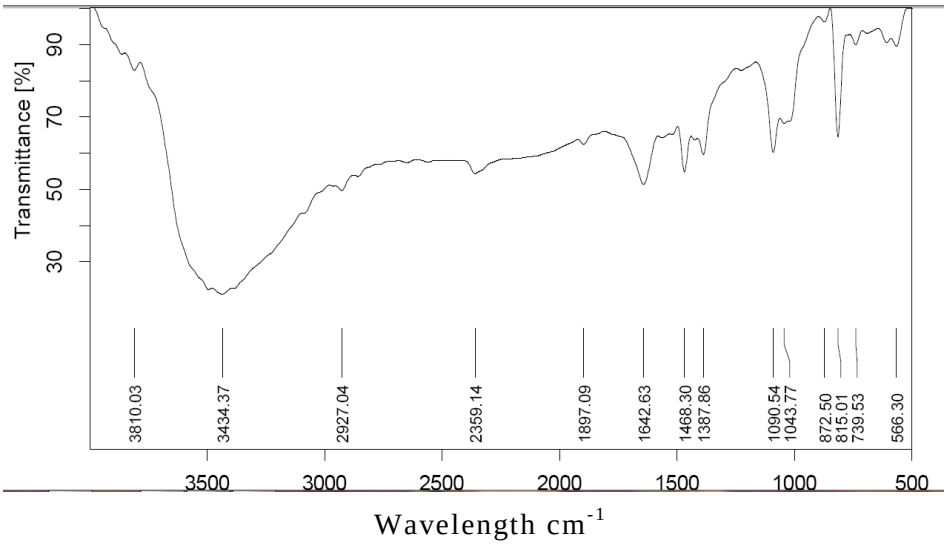
3. CHARACTERIZATION OF THE COMPOUND

3.1. Estimation of Elements

Table A-1

S.No	Element	Percentage	
		Theoretical	Observed
1.	Carbon	32.08	31.15
2.	Chlorine	15.78	15.27
3.	Phosphorus	13.72	13.07
4.	Hydrogen	2.69	2.02
5.	Oxygen	21.37	20.92
6.	Sulphur	14.27	13.98

3.2. I.R. Absorption Spectra



The compound was also identified from its characteristic absorption spectra in KBr disc. IR spectral data of Mono-4-chlorothio phenyl phosphate has been shown in Table A-1. The spectral study was conducted on BRUKER ALPHA FT-IR SPECTROPHOTOMETER (SIRT Bhopal).

IR Spectral Data of Mono-4-chlorothiophenyl Phosphate

Table A-2

S.No	IRv cm^{-1} P-O Stretching	IRv cm^{-1} (O-H) stretching	IRv cm^{-1} (P-S) stretching	IRv cm^{-1} Ar(C-C) stretching	IRv cm^{-1} (C-S) stretching	IRv cm^{-1} Ar(C-CI) stretching
1.	888.67	3433.174	566.30	1433.15	2448.057	1003.46

4. APPLICATIONS

Organophosphates refer to a group of insecticides acting on the enzyme Acetylcholine esterase. Some of their pesticides irreversiby inactivate ACHE which is essential to nerve functioning in insects and many other animals. Due to their versatile applications, they are common carriers of organic groups in biosynthesis. They are widely used in a number of ways as fertilizers[11],fire retardants[12], pesticides[13], smoke generation[14], chemosterilants[15,16,17],synthetic lubricants[18], plasticizers[19] and oil additives[20]. Due to their multipurpose applications, most of the work has been concentrated on studying their pharmacological and toxicological effects and biochemical action and hence are the most important class of organic compounds.

REFERENCES

[1] L.D Quin. , A Guide to Organophosphorus Chemistry, John Wiley & Sons. Inc, New York,P.P. 2,375(2000).

[2] L.F. Audrieth & A.D,F Toy., J.Am. Chem . Soc., 64,1553(1942).

[3] B. Holmstedt, Pharmacol. Rev., 11,567-688(1959).

[4] H. Arnold, F.Bourseaux & N. Brock, Arzneim Forsch , 11,143(1961).

[5] R A .Moss & H. Morales – Rojas, J.Am. Chem. Soc., 123, 7457-7458(2001).

[6] Y. Tonaka, S. Kano & K. Odawara, Nipponsoda Co. Ltd., D.O.S.2.416.178 (1974).

[7] Synthesis and antiviral activity, Chem. Astr., 54, 1303(1961).

[8] G. Gardner & B.A Kilby, J. Chem. Soc., 3, 1769(1950).

[9] A.H. Schlesinger, Chem. Abstr., 49, 5517 (1955).

[10] H.N.Dayer, Chem. Abstr., 53, 1772 (1959).

[11] Mattingly, G .E.G and Failibudeen, O."Topics in Phosphorus Chemistry", 4,157(1967).

[12] C.A. Vernon, V.A, Welch, J. Chem. Soc.,Sec. B: Physical Organic Chemistry (1966).

[13] Grapov A. F and Melnikov N.N., Russ. Chem.Revs., 42,772 (1973).

[14] GOSS, M.F. Jr., J. Chem. Ed., 18, 3 (1941).

[15] Knipling E. F., J. Econ. Entomol., 53,415(1960).

[16] Knipling E. F., ibid, 55,782(1962).

[17] Knipling E. F., Agr. Res., 14(9); 3(1966).

[18] E.F. Norman, Hitchcock, A.C. Robert, Rohar Corswell and E. Derbysire, 1,042,391(1965).

[19] Fisher, E.B and Van Wazer, J. R.,Uses of Org. Phos. Compounds in phosphorus and its comp., Vol. II, Van Wazer, J.R. (ed)., Interscience, N.Y. (1961).

[20] Fisher, J. and Van Wazer (1961).

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