

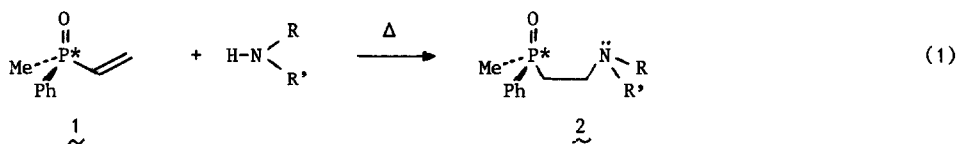
OPTICALLY ACTIVE PHOSPHINE OXIDES. 5.¹ P-CHIRAL 2-AMINOETHYL PHOSPHINE OXIDES

K. Michał Pietrusiewicz* and Maria Zabłocka

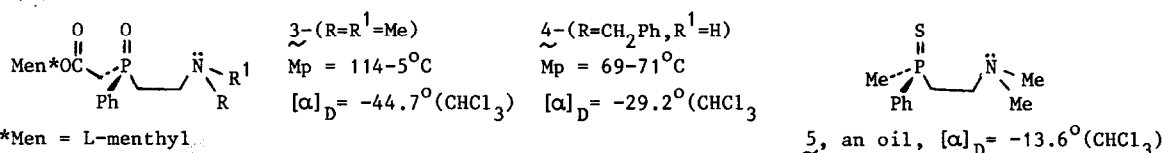
*The Polish Academy of Sciences, Centre of Molecular and
 Macromolecular Studies, Boczna 5, 90-362 Łódź, Poland*

Abstract: Homochiral 2-aminoethyl phosphine oxides are expeditiously prepared by thermal addition of primary and secondary amines to (-)-(S)-methylphenylvinylphosphine oxide. Their transformation into optically active 2-aminoethyl phosphines and 2-aminoethyl phosphine sulphides is exemplified.

In the preceding communication we described the use of (-)-(S)-methylphenylvinylphosphine oxide 1² as a convenient source of a variety of symmetrical and non-symmetrical homochiral 1,2-diphosphinoylethanes.¹ We now report the equally successful use of 1 in the synthesis of optically active (P-chiral) 2-aminoethyl phosphine oxides. The importance of optically active amino phosphorus compounds is well recognized.³



As delineated in eq. 1, the synthesis consisted of a simple addition of primary and secondary amines to 1 and was conveniently carried out under thermal conditions in all studied cases.⁴ Two-step chemical correlation (-)-2a — (-)-1 (1 - CH₃I; 2 - K₂CO₃/H₂O) provided the material of exactly the same specific rotation as the starting 1, i.e., [α]_D = -80° (CHCl₃), and inferred therefore that the synthesized (2-aminoethyl)methylphenylphosphine oxides 2a-k should be considered as virtually optically pure. Also, addition of Me₂NH and PhCH₂NH₂ to a homochiral (-)-(S_P)- (menthoxycarbonylmethyl)phenylvinylphosphine oxide⁶ furnished optically active 3 and 4, respectively, without any detectable epimerization at P.⁷



Exemplary reduction of 2a with PhSiH₃ gave the useful⁸ P-chiral (2-dimethylaminoethyl)methylphenylphosphine (bp. 55°C/0.1 Torr; ³¹P NMR (CHCl₃) δ: -38.6 ppm) which, in turn, upon treatment with S₈ yielded novel optically active sulphide 5.⁹ Since both the reduction¹⁰ and the addition of sulphur¹¹ are known to proceed with retention of configuration at P, the S configuration is assigned to (-)-5. The utility and chemistry of compounds 1-5 is under active investigation.

Table. Synthesis of optically active (2-aminoethyl)methylphenylphosphine oxides 2.^{a,7}

<u>2</u>	R	R'	Isolated ^b Yield [%]	Bp ^c [°C/Torr]	Mp ^d [°C]	[α] _D ^e [deg]	³¹ P NMR ^e δ [ppm]
<u>2a</u>	Me	Me	92	150/0.1	72-4	-24.7	36.9
<u>2b</u>	Et	Et	84	170/0.1	f	-24.2	36.5
<u>2c</u>	-CH ₂ CH ₂ OCH ₂ CH ₂ -		80	195/0.1	f	-10.5	32.6 ^g
<u>2d</u>	c-Hex	Me	68	220/0.1	f	-15.0	30.5 ^h
<u>2e</u>	Ph	Me	70	250/0.1	f	+55.4	34.2 ^g
<u>2f</u>	Me ₂ NCH ₂ CH ₂	Me	91	220/0.1	f	-15.2	36.7
<u>2g</u>	Et	H	89	250/0.1	110-2	-29.2	36.2
<u>2h</u>	PhCH ₂ -	H	72	i	88-9	-20.5	36.2
<u>2i</u>	H ₂ NCH ₂ CH ₂ -	H	84	210/0.1	f	-30.0	35.7
<u>2j</u>	D-Ph(Me)CH-	H	68	i	76-7	+27.3	36.6
<u>2k</u>	L-Ph(Me)CH-	H	78	i	f	-56.1	36.1

^a All of the oxides 2 are of the S_p configuration. ^b Yields given are of the distilled or crystallized material. ^c From Kugelrohr distillation; oven temperature given. ^d Uncorrected. ^e In CHCl₃. ^f An oil. ^g In toluene. ^h In THF. ⁱ Distillation not attempted.

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- Even weakly basic primary amines or N-methylaniline added to 1 without catalyst⁴ although elevation of the reaction temperature up to 110°C was sometimes necessary (entries 2c-e, h, i, k). Typically the reactions were run in an excess of amine as solvent (or amine/toluene mixture when heating was applied) and they required 6-48 h for completion (³¹P NMR monitoring). Subsequent evaporation of the excess of amine and the solvent led to the product which was finally purified by crystallization from benzene or petroleum ether or by distillation *in vacuo*.
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