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Oxidation of Amines with Diphenylseleninic Anhydride

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Summary Several primary amines have been oxidized in high yield to carbonyl compounds using diphenylseleninic anhydride.

IT has recently been demonstrated that PhSe(:O)OSe(:O)Ph (**1**)[1] and PhSe(:O)Cl (**2**)[2] will undergo nucleophilic attack on Se (*e.g.* by an enolate anion), followed by spontaneous elimination of PhSeOH, to effect a net oxidation (*e.g.*, introduction of a double bond α to carbonyl[3]). We report here the application of the anhydride (**1**) to the oxidation, presumably by an analogous pathway, of primary amines, which in several cases leads to excellent yields of carbonyl compounds after hydrolytic workup (see Table). For example, treatment of a solution of 2-adamantylamine in CH_2Cl_2 with 1 equiv. of (**1**)[4] for 24 h at room temp. afforded, after aqueous extraction and preparative t.l.c., a quantitative yield of adamantan-2-one.[5] Treatment of benzylamine with 1 equiv. of (**1**) led to a mixture of benzaldehyde (isolated as benzoic acid) and benzonitrile; with 2 equiv. of (**1**), however, benzonitrile was obtained.

To date, oxidations with (**1**) of amines which could form enamines (*e.g.*, 2-phenylethylamine and 1,2-diphenylethylamine) have led only to unrecognizable products.†

TABLE

Amine	Product	Yield (%)[a]
Ph_2CHNH_2[b]	$Ph_2C{=}O$	97(88)
Fluoren-9-ylamine[b]	Fluoren-9-one	98(84)
2-Adamantylamine[b]	Adamantan-2-one	100(91)
$PhCH_2NH_2$[b]	$PhCO_2H$	13(11)
	PhCN	26(—)
$PhCH_2NH_2$[c]	PhCN	96(—)

[a] Isolated yields from preparative t.l.c.; yields in parentheses refer to product purified by sublimation or recrystallization. [b] With 1 equiv. of reagent (**1**). [c] With 2 equiv of (**1**).

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† Benzil has been identified as a minor product resulting from the reaction of (**1**) with 1,2-diphenylethylamine.

[1] D. H. R. Barton, P. D. Magnus, and M. N. Rosenfeld, *J.C.S. Chem. Comm.*, 1975, 301.

[2] H. J. Reich, J. M. Renga, and I. L. Reich, *J. Amer. Chem. Soc.*, 1975, **97**, 5434.

[3] Other methods for effecting this conversion involve a separate step for oxidation of an organoselenide: K. B. Sharpless, M. W. Young, and R. F. Lauer, *Tetrahedron Letters*, 1973, 1979; K. B. Sharpless, R. F. Lauer, and A. Y. Teranishi, *J. Amer. Chem. Soc.*, 1973, **95**, 6137; H. J. Reich, I. L. Reich, and J. M. Renga, *ibid.*, p. 5813; D. L. J. Clive, *J.C.S. Chem. Comm.*, 1973, 695.

[4] Prepared according to G. Ayrey, D. Barnard, and D. T. Woodbridge, *J. Chem. Soc.*, 1962, 2089.

[5] A major by-product of these reactions is diphenyl diselenide (*cf.*, ref. 2 and D. L. Klayman and W. H. H. Günther, 'Organic Selenium Compounds,' p. 103, Wiley, New York, 1973).