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SELECTIVE O-DEMETHYLATION OF AN AROMATIC METHYLETHER IN THE PRESENCE OF AN AROMATIC METHYLENEDIOXY GROUP WITH TRIMETHYLISILYL IODIDE IN QUINOLINE

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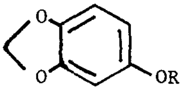
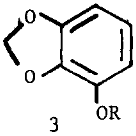
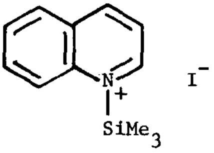
The two methods available for selectively cleaving the aromatic methylenedioxy group in polyoxygenated alkaloids include treatment with BCl_3[1,2], or dilute sulfuric acid in the presence of phloroglucinol.[3] No method of general utility is available which would allow selective dealkylation of the methyl ether function leaving the methylenedioxy group intact.

Trimethylsilyl iodide (Me_3SiI) has recently been introduced as a new agent for effecting ether hydrolysis[4] but model experiments carried out with sesamol methyl ether (1)[5] and 1,2-methylenedioxy-3-methoxybenzene (3)[6] showed that the desired cleavage could not be achieved under the reaction conditions recommended for simple aromatic ethers.[4] The expected reaction did however, begin to take place when the standard solvents (CH_2Cl_2 and $CHCl_3$) were replaced with relatively high boiling aromatic amines, especially quinoline.







1 R = Me 3
2 R = H 4
5

In a typical example 1.5 g of 1 (9.87 mmol) and 2.0 ml of Me_3SiI (15 mmol) were dissolved in 10 ml anhydrous quinoline and heated at 180° for 70 min. The dark solution was poured into 50 ml 5% HCl and extracted with ether (3 x 50 ml). The usual workup involved methanolysis of the residue obtained from the ether extracts and separation into neutral (99 mg 1, TLC) and phenolic parts (1.02 g, 10% NaOH). The phenolic material isolated afforded after filtration through 10 g silica gel (hexane-ether, 9:1) 912 mg of almost pure sesamol (2, mp 63-64°, 72% overall), identical with an authentic sample.[7]

The polyether 3 afforded under the same conditions, but shorter reaction times, the known 2,3-methylenedioxyphenol (4)[8] in similar overall yield.

The reaction of Me_3SiI in quinoline results most probably in the formation of a 1:1 complex of $[Qu \cdot Me_3SiI]$.[9] Such a product can easily be obtained in form of extremely hygroscopic and relatively unstable yellow crystals by mixing the two components in hexane solution. Heating freshly prepared complex with one equivalent of 1 for 1 h at 180° affords after cooling and dilution with ether 1-methylquinolinium iodide as insoluble material (mp 134°, acetoneether; mp 133°[10]) and the trimethylsilyl ether of sesamol[11] as soluble component, identical with an authentic sample by NMR and GC. Methanolysis of this trimethylsilyl ether affords sesamol (2, TLC). It can be speculated that the decomposition of the yellow complex might form the quaternary 1-trimethylsilylquinolinium iodide (5) as the species inducing selective O-dealkylation. For practical purposes it however seems advantageous to prepare the reagent directly in quinoline solution by adding Me_3SiI.

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