Stereoselective Synthesis of 8-Trialkylstannylmenthols

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Abstract: Trialkyltin menthones of type **2** are obtained selectively by 1,4-addition of trialkylstannyl lithium to (-)-pulegone. Reduction of **2** with borane in THF using as catalyst the reagent prepared from borane and (S)-valinol gave a mixture of the corresponding trialkyltin alcohols **3** (Me: 84%; n-Bu: 90,6%) and **4** (Me: 16% and n-Bu: 9,4%).

Introduction

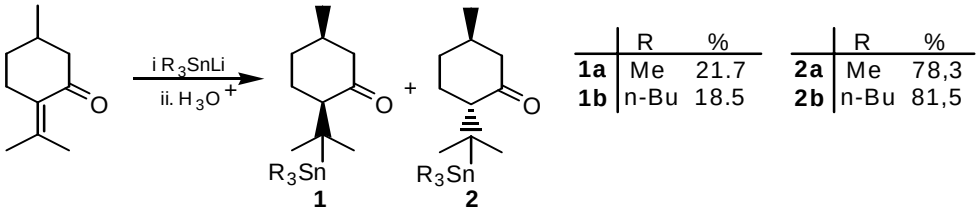
Taking into account the excellent results obtained with the (-)-8-phenylmenthyl group as a chiral auxiliary, we considered of interest the synthesis of some organotin analogues. The 8-triorganotinmenthyl moiety might affect the stereoselectivity due to its bulk and also to electronic effects. The stereoselective synthesis of these compounds was carried out according to Schemes 1 and 2.

Experimental

The 1,4-addition of trimethyl- and tri-n-butyl lithium to (-)-pulegone led to menthones of type **1** and **2** with an average yield of 72% following standard techniques [1]. Compounds **1** and **2** were separated by column chromatography (silica gel 60). The reduction of type **2** ketones with borane in THF using (S)-valinol as a catalyst was carried out according to known procedures [2].

Results and Discussion

The reduction of (-)-menthone carried out with the reagent prepared from borane and (S)-valinol in THF in order to determine the degree of asymmetric induction which can be achieved with this reagent, yielded quantitatively a mixture of (-)-menthol (80%) and (+)-neo-menthol (20%), i.e., 60% of diastereoisomeric excess (d.e.).

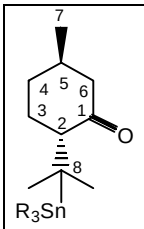


	R	%
1a	Me	21.7
1b	n-Bu	18.5

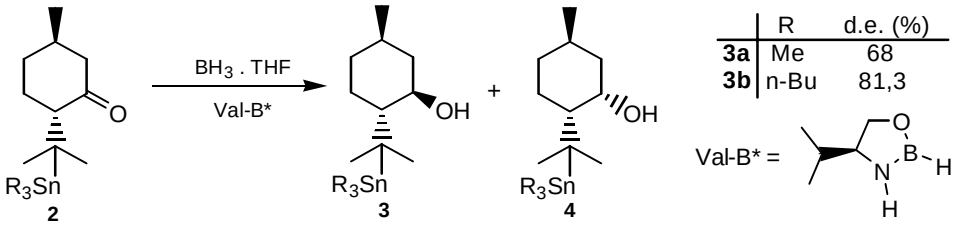
	R	%
2a	Me	78,3
2b	n-Bu	81,5

Scheme 1. 1,4-Addition of trialkylstannyl lithium to (-)-pulegone.

Table 1. ^{119}Sn- and some selected ^{13}C NMR values of the new organotin compounds **2a** and **2b**[a].

	N°	δ $C_1(^3J)$	δ $C_2(^2J)$	δ $C_3(^3J)$	δ $C_8(^1J)$	^{119}Sn	$[\alpha]_D^{20}$(conc.)[b]
	**2a**	213.42 (17.8)	61.25 (7.7)	28.41 (31.0)	32.59 (243,0)	12.7	-35.6º (0,874)
	2b	213.16 (16.1)	61,40 (6.8)	27.94 (NO)	26.47 (388.2)	-8.3	-22.2º (1,94)

a) in $CDCl_3$; ^{n}J(Sn,C) in Hertz; NO = Not Observed. b) In $CHCl_3$.



	R	d.e. (%)
3a	Me	68
3b	n-Bu	81,3

Scheme 2. Stereoselective reduction of trialkylstannylmenthones of type **2.**

Under the same reaction conditions, the reduction of **2a** (d.e. 68%) and **2b** (d.e. 81,3%) led to the corresponding 8-trialkylstannylmenthols with better diastereoisomeric excesses.

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References and Notes

1. Radivoy, G.E.; Doctor in Chemistry Thesis; Universidad Nacional del Sur 1997.
2. Itsuno, S.; Nakano, M.; Miyazaky, K; Masuda, H.; Ito, K.; Hirao, A; Nakahama, S. Asymmetric Synthesis Using Chirally Modified Borohydrides. Part 3. Enantioselective Reduction of Ketones and Oxime Ethers with Reagents Prepared from Borane and Chiral Amino Alcohols. *J. Chem. Soc. Perkin Trans. I*, **1985**, 2039.