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STEREOSPECIFIC DESULFINYLATION OF SULFINYLAZIRIDINES WITH ETHYLMAGNESIUM BROMIDE: A NOVEL SYNTHESIS OF (Z)-N-ARYLAZIRIDINES[1]

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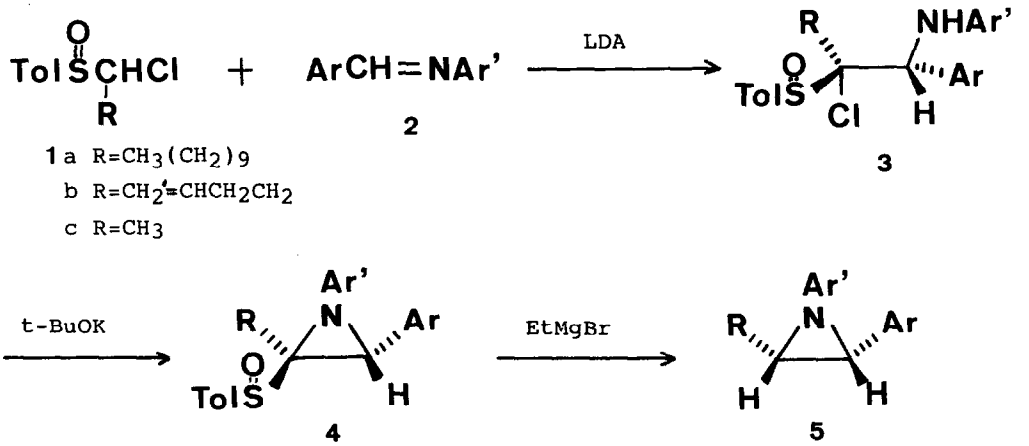
Summary A novel synthesis of (Z)-N-arylaziridines was realized by the stereospecific desulfinylation of (E)-(N-aryl)sulfinylaziridines which were synthesized from 1-chloroalkyl p-tolyl sulfoxides and N-arylimines in high yields.

Recently, aziridines have received considerable attention with interest concerning their use as versatile intermediates in organic synthesis[2] and their biological activity in the antibiotics having aziridine ring such as mytomycins.[3] The synthesis of aziridines[4] is usually classified into two categories. One is the addition of singlet nitrenes to olefines,[5] and the other is the dehydration of β-amino alcohols[6] or the dehydrohalogenation of β-amino halides.[7] As a consequence of the usefulness of aziridines, the development of new method for their synthesis from readily available precursors is welcome.

We have recently reported a new synthesis of epoxides by the desulfinylation of α,β-epoxy sulfoxides.[8] This technology was extended to the nitrogen analogue, sulfinylaziridines, and we found that the chemistry did work excellently giving (Z)-N-arylaziridines. The whole sequence is shown in Scheme 1.



Scheme 1

1-Chlorodecanyl p-tolyl sulfoxide (1a)[8c] was treated with LDA in THF at -60 °C followed by benzalaniline[9] (2; Ar=Ar'=Ph) to give well crystalline adduct in 94% yield. To our surprise, though the adduct has three chiral centers, only one product was obtained. This adduct was cyclized with 2.4 equivalents of potassium *tert*-butoxide in a 1:1-mixture of THF and 2-methyl-2-propanol at 70 °C for 15 min to afford the sulfinylaziridine[10] (4; $R=CH_3(CH_2)_9$, Ar=Ar'=Ph) in 87% yield. The stereochemistry of this sulfinylaziridine was easily determined to be E from its ^1H NMR; the proton on the aziridine ring showed quite low absorption (δ 4.62), which implied that the proton was *cis*-position to the sulfinyl group. Next, the sulfinylaziridine was treated with 1.1 equivalents of BuLi[8] at -100 °C in THF for 10 min; the desired desulfinylation took place to afford (Z)-N-phenylaziridine[11] in 69% yield. However, this reaction always gave some unknown by-products. We studied this desulfinylation with other alkylmetals. The results are summarized in Table 1. As shown in Table 1, the reaction was most effectively conducted with excess ethylmagnesium bromide. The excess methyllithium was also effective. Methylmagnesium bromide showed sharp contrast with ethylmagnesium bromide; even at room temperature the sulfinylaziridine did not react at all with methylmagnesium bromide.

Table 1.
Desulfinylation of Sulfinylaziridine (4; $R=CH_3(CH_2)_9$, Ar=Ar'=Ph) with Alkylmetals

Alkylmetal	(equiv.)	Temp. °C	Time	Yield[a] %
BuLi	(1.1)	-100	10 min	69
MeLi	(1.1)	-70	5 min	trace[b]
	(3.0)	-70	5 min	75
MeMgBr	(3.5)	-55 - 0	2 h	0
EtMgBr	(1.7)	-70 - -50	40 min	79
	(3.5)	-55 - -35	2 h	95
PhMgBr	(3.5)	-55 - -30	2 h	trace[b]

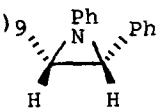
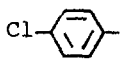
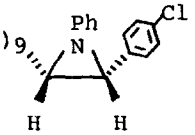
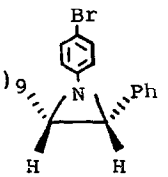
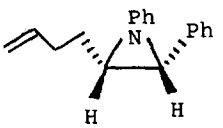
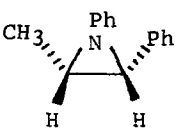
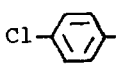
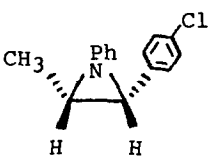
a) Isolated yield. b) Detected on TLC.

The results of the synthesis of (Z)-N-arylaziridines from 1 and imines (2) are summarized in Table 2. The overall yields were uniformly quite good.

This reaction contributes to a novel approach to the synthesis of aziridines and hopefully to a chiral synthesis of aziridines, which is now

Table 2.

Synthesis of (Z)-N-Arylaziridines (5) from 1-Chloroalkyl p-Tolyl Sulfoxides (1) and N-Arylimines (2) Through Sulfinylaziridines (4)

1 R	2 Ar	Ar'	3 Yield[a] %	4 Yield[a] %	5 Conditions[b]	Yield[a] %
$CH_3(CH_2)_9$	Ph	Ph	94	87	A 	95
..		Ph	84	92	B 	88
..	Ph		88	98	C 	85
CH_2=$CHCH_2CH_2$	Ph	Ph	76	83	D 	90
CH_3	Ph	Ph	91	92	E 	89
..		Ph	74	90	F 	91

a) Isolated yield. b) All reactions were conducted with EtMgBr in THF. A: 3.5 equiv., -55 - -35 °C, 2 h. B: 5 equiv., -60 - -50 °C 1 h, then room temp. 20 min. C: 3.5 equiv., -55 - -20 °C 1 h, then room temp. 10 min. D: 5 equiv., -55 - -30 °C 1 h, then room temp. 10 min. E: 5 equiv. -55 - -40 °C 1 h. F: 3.5 equiv., -55 - -25 °C 2 h.

investigated in our laboratory.

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