

# Coupling of 1-alkyl-2-(bromomethyl)aziridines with heteroatom-centered nucleophiles towards 2-[(heteroatom)methyl]aziridines

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Dedicated to Prof. Oleg Kulinkovich on the occasion of his 60th birthday

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## Abstract

The reactivity of 1-alkyl-2-(bromomethyl)aziridines with respect to different types of oxygen-, nitrogen- and sulphur-centered nucleophiles has been evaluated, pointing to the conclusion that these substrates can be applied successfully as synthetic equivalents for the aziridinylmethyl cation synthon towards the corresponding 2-[(heteroatom)methyl]aziridines in good yields.

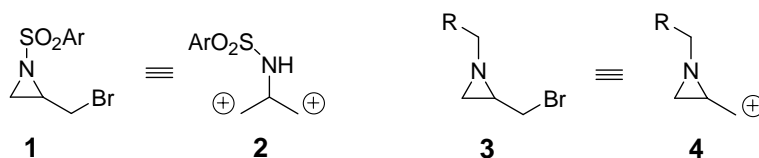
**Keywords:** 2-(Bromomethyl)aziridines, aziridinylmethyl cation synthon, 2-[(heteroatom)methyl]aziridines

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## Introduction

Aziridines have proven to be excellent building blocks for the synthesis of a large variety of ring opened and ring expanded amines due to the inherent reactivity of the constrained ring.<sup>1</sup> 2-(Halomethyl)aziridines comprise a remarkable class of aziridine derivatives with diverse synthetic applications. In former communications, we have demonstrated that activated 1-arenesulfonyl-2-(bromomethyl)aziridines **1** can be applied successfully as synthetic equivalents for the 2-aminopropane dication synthon **2** (Figure 1) towards  $\alpha$ -branched *N*-tosylamides upon treatment with either carbon-centered<sup>2</sup> or heteroatom-centered<sup>3</sup> nucleophiles. Their non-activated counterparts, 1-alkyl-2-(bromomethyl)aziridines **3**,<sup>4</sup> comprise a mainly unexplored class of functionalized aziridine derivatives. Previously, we reported the successful coupling of 1-alkylaziridines **3** with carbon-centered nucleophiles (organocuprates) as a useful method for the synthesis of 1,2-dialkylaziridines, pointing to the observation that 1-alkyl-2-(bromomethyl)aziridines **3** are suitable equivalents for the aziridinylmethyl cation **4** (Figure 1).<sup>5</sup> Contrary to the above-mentioned *N*-activated 1-arenesulfonylaziridines, the focus lies on the

absence of ring opening in order to develop a convenient method for aziridine synthesis. In the present report, the aziridinylmethyl cation equivalency of 1-alkyl-2-(bromomethyl)aziridines **3** will be further elaborated extensively utilizing different heteroatom-centered nucleophiles instead of carbon nucleophiles, affording a suitable approach towards 1-alkyl-2-[(heteroatom)methyl]aziridines as useful synthons in organic chemistry.



**Figure 1**

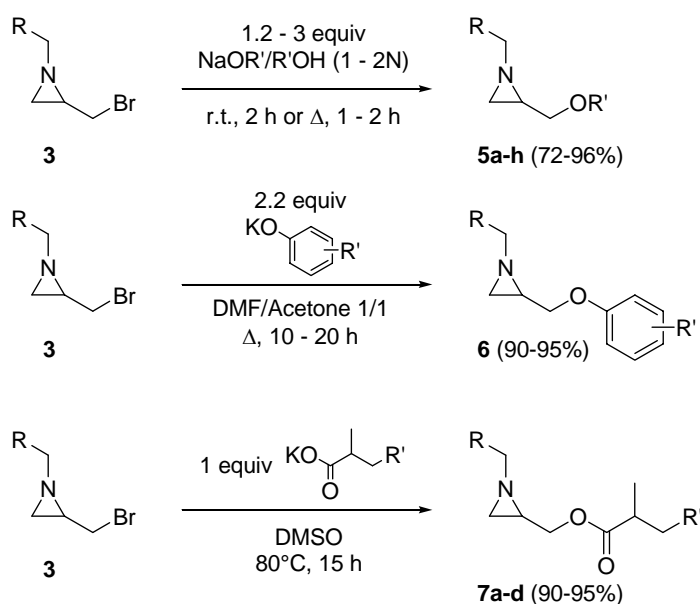
## Results and Discussion

1-Alkyl-2-(bromomethyl)aziridines **3** can easily be prepared in a three-step procedure starting from the appropriate aldehydes.<sup>4</sup> Subsequently, these aziridines **3** were treated with a variety of oxygen, nitrogen and sulphur nucleophiles to afford the corresponding 2-[(heteroatom)methyl]aziridines. As demonstrated before, the substitution of the bromo atom in 1-alkyl-2-(bromomethyl)aziridines **3** by a nucleophile takes place *via* a direct attack at the halogenated carbon atom (instead of ring opening and subsequent ring closure which occurs when *N*-activated 2-(bromomethyl)aziridines **1** are used),<sup>6</sup> which is of significance whenever asymmetric synthesis towards chiral targets compounds is contemplated, e.g. starting from chiral substrates **3**.<sup>7</sup>

For the synthesis of 2-(oxymethyl)aziridines, three different types of oxygen-centered nucleophiles were evaluated successfully, i.e. alkoxides, aryloxides and carboxylates. 1-Alkyl-2-(bromomethyl)aziridines **3** can be easily transformed into the corresponding 2-(alkoxymethyl)aziridines **5** upon treatment with 1.2 – 3 equiv of sodium alkoxides in alcohol at room temperature or reflux for 1 to 2 hours (Scheme 1, Table 1). This has resulted in the synthesis of 2-(methoxymethyl)aziridines **5a,c,e,f**, 2-(ethoxymethyl)aziridine **5b**, 2-(isopropoxymethyl)aziridine **5d** and 2-(allyloxymethyl)aziridine **5g**. This methodology offers an easy and efficient alternative for the procedure developed by Deyrup, in which alcoholic sodium hydroxide (1N) was used for the treatment of 2-(tosyloxymethyl)aziridines upon a prolonged reaction time (2 days).<sup>8</sup> Several other 2-(allyloxymethyl)aziridines have been prepared and used previously for the diastereoselective synthesis of *cis*-3,5-disubstituted morpholine derivatives upon treatment with bromine in dichloromethane.<sup>9</sup> 2-(*tert*-Butoxymethyl)-1-neopentylaziridine **5h** was prepared in a different way, involving the treatment of 2-(bromomethyl)-1-neopentylaziridine with 2 equiv of KO<sup>*t*</sup>Bu in refluxing THF for 1 hour (Table 1, entry 8).

The incorporation of an aryloxy moiety, which is often required for biological activity,<sup>10</sup> can be very efficiently established by means of a nucleophilic substitution of the bromo atom of the aziridines **3** using a phenolate anion as a nucleophile. As reported before, treatment of aziridines **3** with 2.2 equivalents of phenol or, alternatively, a substituted bromo- or chlorophenol, and 5 equivalents of K<sub>2</sub>CO<sub>3</sub> in a mixture of DMF and acetone (1/1) afforded the corresponding 2-(aryloxymethyl)aziridines **6** in excellent yields and high purity after reflux for 10 to 20 hours (Scheme 1).<sup>11</sup> The latter aziridines have been used successfully for the synthesis of biologically relevant 2-amino-1-aryloxy-3-methoxypropanes.<sup>11</sup> Known methods for the synthesis of 2-(aryloxymethyl)aziridines are usually more cumbersome and start from the corresponding 2-(aryloxymethyl)oxiranes<sup>12</sup> or from acyclic  $\beta$ -amino alcohols,<sup>13</sup> or involve the addition of ethoxycarbonylnitrene and the ethoxycarbonylnitrenium ion to allylic ethers.<sup>14</sup>

Alternatively, the potassium salts of two different carboxylic acids were used as oxygen nucleophiles to accomplish the nucleophilic displacement of the bromo atom in aziridines **3**. Thus, 1-arylmethyl-2-(bromomethyl)aziridines **3** were converted into the corresponding 2-(alkanoyloxymethyl)aziridines **7** upon treatment with 1 equiv of potassium 2-methylpropanoate or potassium 2-methylbutyrate in DMSO in excellent yields after heating at 80°C for 15 hours (Scheme 1, Table 2). In the case of 2-methylbutyrate **7d**, the two diastereomers (ratio 53/47) appeared to be inseparable by chromatography (GC and flash).<sup>15</sup> For example, 2-(alkanoyloxymethyl)aziridines **7** can be used for the synthesis of functionalized  $\beta$ -fluoro amines,<sup>15</sup> which are of interest in medicinal chemistry.<sup>16</sup> 2-(Alkanoyloxymethyl)aziridines, mainly 2-(acetoxymethyl)aziridines, have been prepared in other (longer) ways, usually by (enzymatic) acetylation of 2-(hydroxymethyl)aziridines<sup>17</sup> or by ring closure of sulfonylated 1-acetoxy-2-amino-3-hydroxypropanes.<sup>18</sup>



Scheme 1

**Table 1.** Synthesis of 2-(alkoxymethyl)aziridines **5** from 2-(bromomethyl)aziridines **3** (Scheme 1)

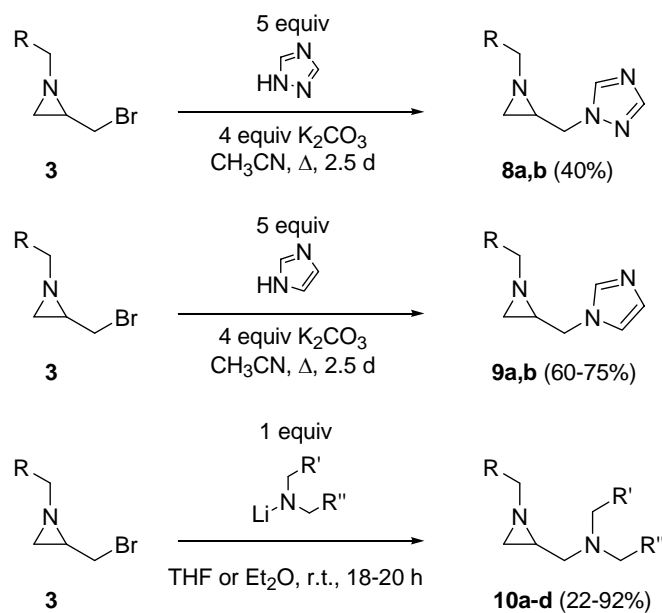
Entry	R	R'	Conditions	Compound <b>5</b> (Yield)
1	C <sub>6</sub> H <sub>5</sub>	Me	1.2 equiv NaOMe/MeOH (2N), r.t., 2 h	<b>5a</b> (93%)
2	C <sub>6</sub> H <sub>5</sub>	Et	1.2 equiv NaOEt/EtOH (2N), r.t., 2 h	<b>5b</b> (81%)
3	n-Pr	Me	1.2 equiv NaOMe/MeOH (2N), r.t., 2 h	<b>5c</b> (92%)
4	C <sub>6</sub> H <sub>5</sub>	<i>i</i> Pr	1.5 equiv NaO <i>i</i> Pr/ <i>i</i> PrOH (1N), Δ, 1 h	<b>5d</b> (73%)
5	C(Me) <sub>2</sub> CH <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	Me	1.5 equiv NaOMe/MeOH (2N), Δ, 1 h	<b>5e</b> (96%)
6	<i>t</i> Bu	Me	3 equiv NaOMe/MeOH (2N), Δ, 1.5 h	<b>5f</b> (72%)
7	4-ClC <sub>6</sub> H <sub>4</sub>	Allyl	2.1 equiv NaOCH <sub>2</sub> CH=CH <sub>2</sub> /allyl alcohol, Δ, 2 h	<b>5g</b> (95%)
8	<i>t</i> Bu	<i>t</i> Bu	2 equiv KO <i>t</i> Bu, THF, Δ, 1 h	<b>5h</b> (75%)

**Table 2.** Synthesis of 2-(alkanoyloxymethyl)aziridines **7** from 2-(bromomethyl)aziridines **3**<sup>15</sup> (Scheme 1)

Entry	R	R'	Compound <b>7</b> (Yield)
1	3-MeC <sub>6</sub> H <sub>4</sub>	H	<b>7a</b> (85%)
2	2-ClC <sub>6</sub> H <sub>4</sub>	H	<b>7b</b> (82%)
3	4-MeC <sub>6</sub> H <sub>4</sub>	H	<b>7c</b> (86%)
4	C <sub>6</sub> H <sub>5</sub>	Me	<b>7d</b> (77%)

Furthermore, also nitrogen-centered nucleophiles have been evaluated to broaden the aziridinylmethyl cation equivalency of 1-alkyl-2-(bromomethyl)aziridines **3**. 1*H*-[1,2,4]Triazole and 1*H*-imidazole were used in a large excess (5 equiv) in refluxing acetonitrile for 2.5 days in the presence of 4 equiv of potassium carbonate to afford the corresponding novel 2-[(1,2,4-triazol-1-yl)methyl]aziridines **8** and 2-[(imidazol-1-yl)methyl]aziridines **9** (Scheme 2, Table 3). An analogous substitution of 1-[(dialkoxyphosphoryl)methyl]-2-(bromomethyl)aziridines by cytosine, thymine, acetylguanine and adenine has been reported, affording 2-substituted aziridines as precursors for the corresponding nucleoside phosphonates as potential biologically active compounds.<sup>19</sup>

Also lithium amides were employed, and treatment of 2-(bromomethyl)aziridines **3** with 1 equiv of a lithium amide in THF or Et<sub>2</sub>O for 18 to 20 hours at room temperature under nitrogen atmosphere furnished the desired 2-(aminomethyl)aziridines **10** (Scheme 2, Table 4). Only very few examples of 2-(*N*-allylaminomethyl)aziridines can be found in the literature.<sup>20,21</sup> 2-(Aminomethyl)aziridines are valuable compounds in medicinal chemistry due to the known anti-tumor activity of platinum complexes of such type of compounds,<sup>22</sup> and they can be used as substrates for the synthesis of biologically relevant diaminopropane derivatives by ring opening reactions.<sup>23</sup>



### Scheme 2

**Table 3.** Synthesis of 2-[(1,2,4-triazol-1-yl)methyl]aziridines **8** and 2-[(imidazol-1-yl)methyl]aziridines **9** from 2-(bromomethyl)aziridines **3** (Scheme 2)

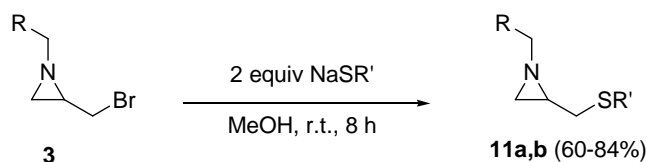
Entry	R	Compound <b>8</b> or <b>9</b> (Yield)
1	C <sub>6</sub> H <sub>5</sub>	<b>8a</b> (40%)
2	4-ClC <sub>6</sub> H <sub>4</sub>	<b>8b</b> (40%)
3	C <sub>6</sub> H <sub>5</sub>	<b>9a</b> (60%)
4	4-ClC <sub>6</sub> H <sub>4</sub>	<b>9b</b> (75%)

**Table 4.** Synthesis of 2-(aminomethyl)aziridines **10** from 2-(bromomethyl)aziridines **3** (Scheme 2)

Entry	R	R'	R''	Compound <b>10</b> (Yield)
1	<i>i</i> Pr	<i>i</i> Pr	CH=CH <sub>2</sub>	<b>10a</b> (40%)
2	<i>t</i> Bu	<i>t</i> Bu	CH=CH <sub>2</sub>	<b>10b</b> (22%)
3	<i>i</i> Pr	Me	Me	<b>10c</b> (92%)
4	<i>t</i> Bu	<i>t</i> Bu	Me	<b>10d</b> (55%)

Finally, two different sulphur-centered nucleophiles were tested for the substitution of the bromo atom in 2-(bromomethyl)aziridines **3**. Sodium isopropylthiolate and sodium allylthiolate (2 equiv) were used successfully in methanol at room temperature to afford 2-[(alkylsulfanyl)methyl]aziridines **11** in an efficient approach (Scheme 3, Table 5). Chiral 2-[(alkylsulfanyl)methyl]aziridines, prepared from acyclic 3-alkylsulfanyl-2-aminopropan-1-ols, have been reported to be excellent catalysts for the enantioselective addition of diethylzinc to aldehydes<sup>24</sup> and for the palladium-catalyzed asymmetric allylic alkylation of 1,3-diphenyl-2-

propenyl acetate with the dimethylmalonate anion.<sup>25</sup> Furthermore, a chiral 2-[(thiophenyl)methyl]-3-*tert*-butylaziridine has been prepared by cyclization of a 2-amino-3-(thiophenyl)propan-1-ol.<sup>26</sup>



### Scheme 3

**Table 5.** Synthesis of 2-[(alkylsulfanyl)methyl]aziridines **11** from 2-(bromomethyl)aziridines **3** (Scheme 3)

Entry	R	R'	Compound <b>11</b> (Yield)
1	4-ClC <sub>6</sub> H <sub>4</sub>	<i>i</i> Pr	<b>11a</b> (84%)
2	4-ClC <sub>6</sub> H <sub>4</sub>	allyl	<b>11b</b> (60%)

Treatment of 2-(bromomethyl)aziridines **3** with 2 equivalents of the ambident nucleophile potassium thiocyanate has been reported previously to afford the corresponding 2-(thiocyanomethyl)aziridines in excellent yields after heating for 20 hours at 70°C in DMF.<sup>27</sup> The latter 2-(thiocyanomethyl)aziridines have been used for the synthesis of 2-iminothiazolidines via an intramolecular cyclisation reaction due to the presence of an electrophilic centre in  $\delta$ -position with regard to the nucleophilic nitrogen atom.

In conclusion, 1-alkyl-2-(bromomethyl)aziridines are excellent synthetic equivalents for the aziridinylmethyl cation, providing an easy access to 1-alkyl-2-[(heteroatom)methyl]aziridines upon treatment with oxygen-, nitrogen- or sulphur-centered nucleophiles. As 1-alkyl-2-(bromomethyl)aziridines are considerably less reactive than the corresponding 1-(arenesulfonyl)aziridines, they are ideally suited for the synthesis of 2-substituted aziridine derivatives. In contrast with 1-arenesulfonyl-2-[(heteroatom)methyl]aziridines, the aziridine ring of 1-alkyl-2-[(heteroatom)methyl]aziridines is not susceptible to ring opening upon treatment with an excess of reagent.

## Experimental Section

### Synthesis of 2-(alkoxymethyl)aziridines **5**. General procedure

2-(Bromomethyl)aziridine **3** (15 mmol) was dissolved in a solution of sodium alkoxide in the corresponding alcohol (1 - 2N, 1.2 - 3 equiv) and the mixture was stirred for 2 hours at room temperature or heated under reflux for 1 - 2 hours. Extraction with dichloromethane, drying

(MgSO<sub>4</sub>), filtration of the drying agent and removal of the solvent *in vacuo* afforded the corresponding 2-(alkoxymethyl)aziridine **5**, which can be purified by distillation.

**1-Benzyl-2-(methoxymethyl)aziridine (5a).** Yield 93%. Colorless oil. <sup>1</sup>H NMR (60 MHz, CCl<sub>4</sub>): δ 1.1-1.8 (3H, m, NCH<sub>2</sub>CH); 3.1-3.6 (2H, m, OCH<sub>2</sub>); 3.28 (3H, s, OCH<sub>3</sub>); 3.29 and 3.51 (2H, 2×d, J=14 Hz, NCH<sub>2</sub>Ar); 7.33 (5H, s, C<sub>6</sub>H<sub>5</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 31.27 (NCH<sub>2</sub>CH); 38.36 (NCH); 58.47 (OCH<sub>3</sub>); 64.24 (NCH<sub>2</sub>Ar); 74.48 (OCH<sub>2</sub>); 126.96 (NCH<sub>2</sub>HC<sub>para</sub>); 128.01 and 128.24 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 139.03 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν = 1498, 1456, 1347, 1164, 1109. MS (70 eV) m/z (%): 177 (M<sup>+</sup>, 5); 147 (21); 146 (21); 91 (100); 86 (75); 65 (18); 56 (69), 45 (69). Purity (GC) > 97%. Anal. Calcd for C<sub>11</sub>H<sub>15</sub>NO: C 74.54, H 8.53, N 7.90. Found: C 74.71, H 8.68, N 7.77.

**1-Benzyl-2-(ethoxymethyl)aziridine (5b).** Yield 81%. Colorless oil. Bp. 45-48°C/0.04 mmHg. <sup>1</sup>H NMR (60 MHz, CCl<sub>4</sub>): δ 1.1-1.9 (3H, m, NCH<sub>2</sub>CH); 1.12 (3H, t, J=7.0 Hz, CH<sub>3</sub>); 3.0-3.6 (6H, m, NCH<sub>2</sub>Ar and CH<sub>2</sub>OCH<sub>2</sub>); 7.28 (5H, s, C<sub>6</sub>H<sub>5</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 15.17 (CH<sub>3</sub>); 31.71 (NCH<sub>2</sub>CH); 38.61 (NCH); 64.37 (NCH<sub>2</sub>Ar); 66.30 (OCH<sub>2</sub>Me); 72.73 (OCH<sub>2</sub>CHN); 127.02 (NCH<sub>2</sub>HC<sub>para</sub>); 128.05 and 128.31 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 139.04 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν = 1496, 1456, 1338, 1163, 1110. MS (70 eV) m/z (%): 191 (M<sup>+</sup>, 1); 147 (10); 146 (16); 91 (97); 72 (25); 65 (23); 56 (100). Anal. Calcd for C<sub>12</sub>H<sub>17</sub>NO: C 75.35, H 8.96, N 7.32. Found: C 75.47, H 9.13, N 7.54.

**2-(Methoxymethyl)-1-propylaziridine (5c).** Yield 92%. Colorless oil. <sup>1</sup>H NMR (60 MHz, CDCl<sub>3</sub>): δ 0.93 (3H, ~t, CH<sub>3</sub>); 1.1-2.5 (9H, m, (CH<sub>2</sub>)<sub>3</sub>NCH<sub>2</sub>CH); 3.3-3.6 (2H, m, CH<sub>2</sub>O); 3.45 (3H, s, OCH<sub>3</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 14.08 (CH<sub>3</sub>); 20.54 (CH<sub>2</sub>CH<sub>3</sub>); 31.34 and 31.93 (NCH<sub>2</sub>CH and NCH<sub>2</sub>CH<sub>2</sub>); 37.98 (NCH); 58.84 (OCH<sub>3</sub>); 61.01 (NCH<sub>2</sub>Pr); 74.92 (CH<sub>2</sub>OCH<sub>3</sub>). IR (NaCl, cm<sup>-1</sup>): ν = 1460, 1347, 1168, 1114. MS (70 eV) m/z (%): 143 (M<sup>+</sup>, 3); 100 (25); 98 (53); 86 (13); 70 (100); 58 (12); 57 (21); 58 (12); 57 (21); 56 (35); 55 (12); 45 (41). Purity (GC) > 97%. Anal. Calcd for C<sub>8</sub>H<sub>17</sub>NO: C 67.09, H 11.96, N 9.78. Found: C 67.22, H 12.11, N 9.88.

**1-Benzyl-2-(isopropoxymethyl)aziridine (5d).** Yield 73%. Colorless oil. Bp. 88-96°C/0.4 mmHg. <sup>1</sup>H NMR (270 MHz, CDCl<sub>3</sub>): δ 1.12 (6H, d, J=6.3 Hz, (CH<sub>3</sub>)<sub>2</sub>CH); 1.45 (1H, d, J=6.6 Hz, N(H<sub>cis</sub>CH)CH); 1.70 (1H, d, J=3.6 Hz, N(HCH<sub>trans</sub>)CH); 1.72-1.80 (1H, m, NCH<sub>2</sub>CH); 3.37-3.43 (2H, m, CH<sub>2</sub>O); 3.45 (2H, s, NCH<sub>2</sub>Ar); 3.53-3.62 (1H, m, CHO); 7.22-7.38 (5H, m, C<sub>6</sub>H<sub>5</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 21.80 and 22.28 ((CH<sub>3</sub>)<sub>2</sub>CH); 31.86 (NCH<sub>2</sub>CH); 39.01 (NCH); 64.33 (NCH<sub>2</sub>Ar); 70.35 (OCH<sub>2</sub>); 71.46 (CHO); 126.97 (NCH<sub>2</sub>HC<sub>para</sub>); 127.99 and 128.28 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 139.08 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν = 2966, 1497, 1454, 1380, 1370, 1327, 1160, 1130, 1075, 1028. MS (70 eV) m/z (%): no M<sup>+</sup>; 162 (M<sup>+</sup>-43); 146 (22); 132 (11); 91 (100); 72 (25); 65 (13); 56 (33). Anal. Calcd for C<sub>13</sub>H<sub>19</sub>NO: C 76.06, H 9.33, N 6.82. Found: C 76.26, H 9.50, N 6.68.

**1-(2,2-Dimethyl-3-phenylpropyl)-2-(methoxymethyl)aziridine (5e).** Yield 96%. Colorless oil. <sup>1</sup>H NMR (60 MHz, CDCl<sub>3</sub>): δ 0.90 (6H, s, 2×CH<sub>3</sub>); 1.1-1.7 (3H, m, NCH<sub>2</sub>CH); 2.04 and 2.66 (2×2H, 2×s, NCH<sub>2</sub>C(Me)<sub>2</sub>CH<sub>2</sub>Ar); 3.2-3.4 (2H, m, OCH<sub>2</sub>); 3.36 (3H, s, OCH<sub>3</sub>); 7.26 (5H, s, C<sub>6</sub>H<sub>5</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 25.66 and 25.75 (2×CH<sub>3</sub>); 32.11 (CH<sub>2</sub>CHN); 36.41

(C(Me)<sub>2</sub>); 38.35 (CHN); 46.61 (CH<sub>2</sub>Ar); 58.62 (OCH<sub>3</sub>); 71.60 (OCH<sub>2</sub>); 75.04 (NCH<sub>2</sub>C); 125.73 (HC<sub>para</sub>); 127.56 and 130.67 (HC<sub>ortho</sub> and HC<sub>meta</sub>); 139.10 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>OMe</sub> = 2820; ν<sub>az</sub> = 3025. MS (70 eV) m/z (%): 233 (M<sup>+</sup>, 14); 188 (8); 146 (6); 131 (9); 100 (56); 91 (28); 71 (12); 70 (40); 56 (8); 55 (8); 45 (16); 42 (100). Purity (GC) > 97%. Anal. Calcd for C<sub>15</sub>H<sub>23</sub>NO: C 77.21, H 9.93, N 6.00. Found: C 77.34, H 10.09, N 5.88.

**1-Neopentyl-2-(methoxymethyl)aziridine (5f).** Yield 72%. Colorless oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 60 MHz): δ 0.97 (9H, s, (CH<sub>3</sub>)<sub>3</sub>C); 1.2-1.7 (3H, m, CH<sub>2</sub>CHN); 1.98 and 2.14 (2H, 2×d, J=11.0 Hz, N(HCH)*t*Bu); 3.38 (3H, s, OCH<sub>3</sub>); 3.2-3.4 (2H, m, OCH<sub>2</sub>). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 25.59 ((CH<sub>3</sub>)<sub>3</sub>C); 29.17 (CH<sub>2</sub>CHN); 30.02 ((CH<sub>3</sub>)<sub>3</sub>C); 35.88 (CHN); 56.08 (CH<sub>3</sub>O); 71.10 (CH<sub>2</sub>O); 72.41 (NCH<sub>2</sub>*t*Bu). IR (NaCl, cm<sup>-1</sup>): ν<sub>OMe</sub> = 2820; ν<sub>az</sub> = 3040. MS (70 eV) m/z (%): 157 (M<sup>+</sup>, 1); 112 (7); 100 (21); 71 (7); 70 (22); 57 (6); 56 (7); 55 (6); 45 (21); 43 (15); 42 (100); 41 (21). Purity (GC) > 97%. Anal. Calcd for C<sub>9</sub>H<sub>19</sub>NO: C 68.74, H 12.18, N 8.91. Found: C 68.91, H 12.37, N 8.78.

**1-[(4-Chlorophenyl)methyl]-2-[(propenyloxy)methyl]aziridine (5g).** Yield 95%. Light-yellow oil. Filtration through a pad of silica (Hexane/EtOAc 5/4). <sup>1</sup>H NMR (270 MHz, CDCl<sub>3</sub>): δ 1.45 (1H, d, J=6.2 Hz, N(H<sub>cis</sub>CH)CH); 1.73 (1H, d, J=3.6 Hz, N(HCH<sub>trans</sub>)CH); 1.77-1.85 (1H, m, NCH); 3.35 and 3.50 (2H, 2×d×d, J=10.6, 6.6, 4.3 Hz, NCH(HCH)O); 3.43-3.44 (2H, m, NCH<sub>2</sub>Ar); 3.96 (2H, d, J=4.9 Hz, OCH<sub>2</sub>CH=CH<sub>2</sub>); 5.15-5.28 (2H, m, CH=CH<sub>2</sub>); 5.81-5.96 (1H, m, CH=CH<sub>2</sub>); 7.30 (4H, s, CH<sub>arom</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 31.23 (NCH<sub>2</sub>CH); 38.56 (NCH); 63.27 (NCH<sub>2</sub>Ar); 71.63 (OCH<sub>2</sub>CH=CH<sub>2</sub>); 72.18 (NCHCH<sub>2</sub>O); 116.62 (CH=CH<sub>2</sub>); 128.25 and 129.20 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 132.45 (CCl); 134.64 (CH=CH<sub>2</sub>); 137.63 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>max</sub> = 1646, 1598, 1492, 1466, 1088, 807. MS (70 eV): m/z (%): 237/9 (M<sup>+</sup>, 2); 180/2 (43); 167 (24); 147 (35); 126 (14); 125/7 (100); 91 (56); 89 (22); 71 (10). Anal. Calcd for C<sub>13</sub>H<sub>16</sub>ClNO: C 65.68, H 6.78, N 5.89. Found: C 65.89, H 6.92, N 5.69.

**2-(tert-Butoxymethyl)-1-neopentylaziridine (5h).** Yield 75%. Colorless oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 60 MHz): δ 0.97 (9H, s, (CH<sub>3</sub>)<sub>3</sub>CCH<sub>2</sub>); 1.18 (9H, s, (CH<sub>3</sub>)<sub>3</sub>CO); 1.2-1.7 (3H, m, CH<sub>2</sub>CHN); 2.02 and 2.31 (2H, 2×d, J=11.5 Hz, N(HCH)*t*Bu); 3.0-3.7 (2H, m, OCH<sub>2</sub>). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 27.58 and 28.24 (2×(CH<sub>3</sub>)<sub>3</sub>C); 31.81 (CH<sub>2</sub>CHN); 32.61 ((CH<sub>3</sub>)<sub>3</sub>CCH<sub>2</sub>); 40.10 (CHN); 64.70 (CH<sub>2</sub>O); 72.50 ((CH<sub>3</sub>)<sub>3</sub>CO); 73.67 (NCH<sub>2</sub>*t*Bu). IR (NaCl, cm<sup>-1</sup>): ν<sub>az</sub> = 3040. MS (70 eV) m/z (%): 199 (M<sup>+</sup>, 1); 142 (7); 112 (26); 86 (100); 57 (59). Purity (GC) > 97%. Anal. Calcd for C<sub>12</sub>H<sub>25</sub>NO: C 72.31, H 12.64, N 7.03. Found: C 72.44, H 12.80, N 6.90.

### Synthesis of 2-(alkanoyloxymethyl)aziridines 7. General procedure

To a solution of carboxylic acid (0.01 mol) in DMSO (15 mL) was added K<sub>2</sub>CO<sub>3</sub> (2 equiv), and the resulting suspension was stirred for 30' at room temperature. Subsequently, 2-(bromomethyl)aziridine **3** (0.01 mol) was added, and the mixture was heated at 80°C for 15 hours. The reaction mixture was poured into water (20 mL) and extracted with Et<sub>2</sub>O (3×15 mL). The combined organic extracts were washed with water (2×15 mL) and brine (20 mL). Drying (MgSO<sub>4</sub>), filtration of the drying agent and evaporation of the solvent afforded the corresponding



2-(alkanoyloxymethyl)aziridine **7**, which was purified by filtration through silica gel (hexane/EtOAc 5/3).

The spectral data of 1-(3-methylbenzyl)aziridin-2-ylmethyl 2-methylpropanoate **7a** have been reported elsewhere.<sup>15</sup>

**1-(2-Chlorobenzyl)aziridin-2-ylmethyl 2-methylpropanoate (7b).** Yield 82%. Light-yellow oil. Filtration through silica gel (hexane/EtOAc 5/3). <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 1.13 and 1.15 (6H, 2×d, J=6.9 Hz, (CH<sub>3</sub>)<sub>2</sub>CH); 1.57 (1H, d, J=6.3 Hz, (H<sub>cis</sub>CH)N); 1.85 (1H, d, J=3.6 Hz, (HCH<sub>trans</sub>)N); 1.88-1.95 (1H, m, NCH); 2.52 (1H, sept, J=7.0 Hz, (CH<sub>3</sub>)<sub>2</sub>CH); 3.44 and 3.69 (2H, 2×d, J=15.1 Hz, N(HCH)Ar); 3.85 and 4.27 (2H, 2×d×d, J=11.7, 7.6, 4.3 Hz, (HCH)O); 7.17-7.35 and 7.67-7.69 (3H and 1H, 2×m, CH<sub>arom</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 18.90 and 18.95 ((CH<sub>3</sub>)<sub>2</sub>CH); 31.64 (NCH<sub>2</sub>CH); 33.90 ((CH<sub>3</sub>)<sub>2</sub>CH); 37.47 (CHN); 60.92 (NCH<sub>2</sub>Ar); 66.46 (CH<sub>2</sub>O); 126.79, 128.08, 129.03 and 129.23 (HC<sub>arom</sub>); 132.88 (CCl); 136.71 (NCH<sub>2</sub>C<sub>arom,quat</sub>); 176.84 (CO). IR (NaCl): ν<sub>C=O</sub> = 1735 cm<sup>-1</sup>. MS (70 eV): m/z (%): 268/70 (M<sup>+</sup>+1, 100). Anal. Calcd for C<sub>14</sub>H<sub>18</sub>ClNO<sub>2</sub>: C 62.80, H 6.78, N 5.23. Found: C 62.97, H 6.98, N 5.11.

**1-(4-Methylbenzyl)aziridin-2-ylmethyl 2-methylpropanoate (7c).** Yield 86%. Light-yellow oil. Filtration through silica gel (hexane/EtOAc 5/3). <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 1.10 and 1.11 (6H, 2×d, J=7.0 Hz, (CH<sub>3</sub>)<sub>2</sub>CH); 1.51 (1H, d, J=6.3 Hz, (H<sub>cis</sub>CH)N); 1.77 (1H, d, J=3.6 Hz, (HCH<sub>trans</sub>)N); 1.81-1.89 (1H, m, NCH); 2.33 (3H, s, CH<sub>3</sub>Ar); 2.46 (1H, sept, J=7.1 Hz, (CH<sub>3</sub>)<sub>2</sub>CH); 3.26 and 3.56 (2H, 2×d, J=13.2 Hz, N(HCH)Ar); 3.80 and 4.19 (2H, 2×d×d, J=11.6, 7.4, 4.7 Hz, (HCH)O); 7.12-7.30 (4H, m, CH<sub>arom</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 18.87 ((CH<sub>3</sub>)<sub>2</sub>CH); 21.07 (CH<sub>3</sub>Ar); 31.65 (NCH<sub>2</sub>CH); 33.85 ((CH<sub>3</sub>)<sub>2</sub>CH); 37.12 (CHN); 64.03 (NCH<sub>2</sub>Ar); 66.51 (CH<sub>2</sub>O); 128.07 and 129.02 (HC<sub>arom</sub>); 135.76 and 136.62 (2×C<sub>arom,quat</sub>); 177.02 (CO). IR (NaCl): ν<sub>C=O</sub> = 1735 cm<sup>-1</sup>. MS (70 eV): m/z (%): 248 (M<sup>+</sup>+1, 100). Anal. Calcd for C<sub>15</sub>H<sub>21</sub>NO<sub>2</sub>: C 72.84, H 8.56, N 5.66. Found: C 72.97, H 8.71, N 5.59.

**1-Benzylaziridin-2-ylmethyl 2-methylbutyrate (7d).** Mixture of diastereomers, ratio 53/47. Yield 77%. Light-yellow oil. Filtration through silica gel (hexane/EtOAc 5/3). <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>): δ 0.87 (3H, t, J=7.4 Hz, CH<sub>3</sub>CH<sub>2</sub>); 0.88 (3H, t, J=7.3 Hz, CH<sub>3</sub>CH<sub>2</sub>); 1.08 and 1.09 (2×3H, 2×d, J=6.9 Hz, 2×CH<sub>3</sub>CH); 1.37-1.49 (2H, m, 2×(HCH)CH<sub>3</sub>); 1.52 (2H, d, J=6.6 Hz, 2×(H<sub>cis</sub>CH)N); 1.57-1.74 (2H, m, 2×(HCH)CH<sub>3</sub>); 1.79 (2H, d, J=3.3 Hz, 2×(HCH<sub>trans</sub>)N); 1.83-1.90 (2H, m, 2×NCH); 2.25-2.44 (2H, m, 2×CHCH<sub>3</sub>); 3.32 and 3.58, 3.34 and 3.60 (2×2H, 2×(2×d), J=13.5 Hz, 2×N(HCH)Ar); 3.83 (1H, d×d, J=11.6, 7.4 Hz, (HCH)O); 3.83 (1H, d×d, J=11.7, 7.3 Hz, (HCH)O); 4.11-4.31 (2H, m, 2×(HCH)O); 7.23-7.40 (5H, m, C<sub>6</sub>H<sub>5</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 11.59 (2×CH<sub>3</sub>CH<sub>2</sub>); 16.46 (2×CH<sub>3</sub>CH); 26.69 (2×CH<sub>3</sub>CH<sub>2</sub>); 31.65 (2×NCH<sub>2</sub>CH); 37.28 and 37.33 (2×CHN); 40.92 (2×CHCH<sub>3</sub>); 64.29 (2×NCH<sub>2</sub>Ar); 66.45 (2×CH<sub>2</sub>O); 127.09 (2×NCH<sub>2</sub>HC<sub>para</sub>); 128.05 and 128.33 (2×NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 138.94 (2×C<sub>arom,quat</sub>); 176.38 (2×CO). IR (NaCl): ν<sub>C=O</sub> = 1736 cm<sup>-1</sup>. MS (70 eV): m/z (%): 247 (M<sup>+</sup>, 3); 219 (3); 146 (37); 91 (100); 85 (26); 72 (13); 57 (80). Anal. Calcd for C<sub>15</sub>H<sub>21</sub>NO<sub>2</sub>: C 72.84, H 8.56, N 5.66. Found: C 73.03, H 8.76, N 5.58.

**Synthesis of 2-[(1,2,4-triazol-1-yl)methyl]aziridines 8 and 2-[(imidazol-1-yl)methyl]aziridines 9. General procedure**

To a solution of 2-(bromomethyl)aziridine **3** (4.5 mmol) in acetonitrile (50 mL) was added 1,2,4-triazole (5 equiv) and potassium carbonate (4 equiv). The resulting mixture was heated under reflux for 2.5 days, filtered and the solvent was removed in vacuo. A solution of sodium hydroxide (75 mL, 1N) was added to the residue, followed by extraction with diethyl ether (3×40 mL). Drying (K<sub>2</sub>CO<sub>3</sub>), filtration of the drying agent and evaporation of the solvent afforded the corresponding 2-[(1,2,4-triazol-1-yl)methyl]aziridine **8**, which was purified by column chromatography on silica gel (CHCl<sub>3</sub>/MeOH).

**1-Benzyl-2-[(1,2,4-triazol-1-yl)methyl]aziridine (8a).** Yield 40%. Colorless oil. R<sub>f</sub> = 0.13 (CHCl<sub>3</sub>/MeOH 95/5). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.63 (1H, d, J=6.3 Hz, N(H<sub>cis</sub>CH)CH); 1.84 (1H, d, J=3.3 Hz, N(HCH<sub>trans</sub>)CH); 2.01-2.09 (1H, m, CHN); 3.25 and 3.53 (2H, 2×d, J=12.9 Hz, N(HCH)Ar); 3.93 and 4.32 (2H, 2×d×d, J=14.2, 7.6, 4.3 Hz, NCH(HCH)N); 7.18-7.36 (5H, m, C<sub>6</sub>H<sub>5</sub>); 7.85 and 7.92 (2×1H, 2×s, 2×N=CH). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 32.61 (CH<sub>2</sub>N); 37.65 (NCH); 52.60 (NCHCH<sub>2</sub>N); 64.10 (NCH<sub>2</sub>Ar); 126.84 (NCH<sub>2</sub>HC<sub>para</sub>); 128.03 and 128.48 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 138.18 (C<sub>arom,quat</sub>); 143.07 and 151.61 (2×N=CH). IR (NaCl, cm<sup>-1</sup>): ν<sub>C=N</sub> = 1658. MS (70 eV) m/z (%): no M<sup>+</sup>; 205 (20); 159 (15); 158 (19); 157 (11); 144 (19); 118 (35); 106 (19); 105 (14); 91 (63); 89 (10); 80 (10); 79 (100); 78 (13); 77 (62); 71 (10); 65 (18); 53 (15); 52 (10); 51 (32); 50 (15). Anal. Calcd for C<sub>12</sub>H<sub>14</sub>N<sub>4</sub>: C 67.27, H 6.59, N 26.15. Found: C 67.41, H 6.83, N 26.03.

**1-[4-(Chlorophenyl)methyl]-2-[(1,2,4-triazol-1-yl)methyl]aziridine (8b).** Yield 40%. Colorless oil. R<sub>f</sub> = 0.15 (CHCl<sub>3</sub>/MeOH 97/3). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.61 (1H, d, J=6.3 Hz, N(H<sub>cis</sub>CH)CH); 1.85 (1H, d, J=3.3 Hz, N(HCH<sub>trans</sub>)CH); 2.02-2.10 (1H, m, CHN); 3.27 and 3.44 (2H, 2×d, J=13.2 Hz, N(HCH)Ar); 3.95 and 4.32 (2H, 2×d×d, J=14.4, 7.6, 4.0 Hz, NCH(HCH)N); 7.13 and 7.26 (2×2H, 2×d, J=8.4 Hz, 4×CH<sub>arom</sub>); 7.88 and 7.90 (2×1H, 2×s, 2×N=CH). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 33.23 (CH<sub>2</sub>N); 38.15 (NCH); 52.94 (NCHCH<sub>2</sub>N); 63.74 (NCH<sub>2</sub>Ar); 128.97 and 129.67 (2×HC<sub>arom</sub>); 133.51 (CCl); 137.18 (NCH<sub>2</sub>C<sub>arom,quat</sub>); 143.54 and 152.22 (2×N=CH). IR (NaCl, cm<sup>-1</sup>): ν<sub>C=N</sub> = 1635. MS (70 eV) m/z (%): no M<sup>+</sup>; 180 (17); 179 (19); 178 (19); 166/8 (37); 125/7 (100); 111 (13); 110 (12); 91 (10); 89 (24); 70 (12); 63 (10); 55 (22), 54 (99). Anal. Calcd for C<sub>12</sub>H<sub>13</sub>ClN<sub>4</sub>: C 57.95, H 5.27, N 22.53. Found: C 58.12, H 5.36, N 22.38.

**1-Benzyl-2-[(imidazol-1-yl)methyl]aziridine (9a).** Yield 60%. Colorless oil. R<sub>f</sub> = 0.26 (CHCl<sub>3</sub>/MeOH 97/3). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.56 (1H, d, J=6.3 Hz, N(H<sub>cis</sub>CH)CH); 1.79 (1H, d, J=3.3 Hz, N(HCH<sub>trans</sub>)CH); 1.82-1.90 (1H, m, CHN); 3.40 and 3.45 (2H, 2×d, J=12.9 Hz, N(HCH)Ar); 3.78 and 4.04 (2H, 2×d×d, J=14.4, 7.3, 4.1 Hz, NCH(HCH)N); 6.88 and 7.01 (2×1H, 2×s, NCH=CH); 7.26-7.32 (5H, m, C<sub>6</sub>H<sub>5</sub>); 7.46 (1H, s, NHC=N). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 31.22 (CH<sub>2</sub>N); 37.81 (NCH); 48.84 (NCHCH<sub>2</sub>N); 63.11 (NCH<sub>2</sub>Ar); 118.19 (HC=CH); 126.38 and 128.21 (NCH<sub>2</sub>HC<sub>para</sub> and HC=CH); 127.19 and 127.57 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 136.08 (HC=N); 137.66 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>C=N</sub> = 1666. MS (70 eV) m/z (%): no M<sup>+</sup>; 213 (19); 146 (10); 132 (63); 122 (17); 109 (17); 108 (10); 105 (26); 95

(15); 91 (100); 65 (14). Anal. Calcd for C<sub>13</sub>H<sub>15</sub>N<sub>3</sub>: C 73.21, H 7.09, N 19.70. Found: C 73.37, H 7.25, N 19.58.

**1-[4-(Chlorophenyl)methyl]-2-[(imidazol-1-yl)methyl]aziridine (9b).** Yield 75%. Colorless oil. R<sub>f</sub> = 0.15 (CHCl<sub>3</sub>/MeOH 95/5). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.54 (1H, d, J=6.3 Hz, N(H<sub>cis</sub>CH)CH); 1.79 (1H, d, J=3.3 Hz, N(HCH<sub>trans</sub>)CH); 1.79-1.89 (1H, m, CHN); 3.33 and 3.42 (2H, 2×d, J=13.4 Hz, N(HCH)Ar); 3.77 and 4.06 (2H, 2×d×d, J=14.4, 7.3, 4.1 Hz, NCH(HCH)N); 6.88 and 7.01 (2×1H, 2×s, NCH=CH); 7.19 and 7.28 (2×2H, 2×d, J=8.6 Hz, 4×CH<sub>arom</sub>); 7.48 (1H, s, NHC=N). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 31.72 (CH<sub>2</sub>N); 38.33 (NCH); 49.17 (NCHCH<sub>2</sub>N); 62.66 (NCH<sub>2</sub>Ar); 118.51 (HC=CH); 127.96 and 128.84 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 128.57 (HC=CH); 132.29 (CCl); 136.53 (HC=N); 136.69 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>C=N</sub> = 1630. MS (70 eV) m/z (%): 247/9 (M<sup>+</sup>, 14); 148 (11); 125/7 (73); 109 (17); 108 (15); 107 (13); 95 (16); 87 (11); 85 (67); 83 (100); 81 (10); 48 (12); 47 (27). Anal. Calcd for C<sub>13</sub>H<sub>14</sub>ClN<sub>3</sub>: C 63.03, H 5.70, N 16.96. Found: C 63.20, H 5.88, N 16.89.

### Synthesis of 2-(aminomethyl)aziridines 10. General procedure

To an ice-cooled solution of a secondary amine (5 mmol) in dry diethyl ether or THF (5 mL) was added dropwise *n*-BuLi (2 mL, 1 equiv, 2.5M in hexane) via a syringe under nitrogen atmosphere. After stirring for 1 hour at 0°C, a solution of 2-(bromomethyl)aziridine **3** (1 equiv) in Et<sub>2</sub>O or THF (5 mL) was added via a syringe at 0°C. The resulting solution was further stirred at room temperature for 18-20 hours under nitrogen atmosphere. Workup was carried out by pouring the reaction mixture in an aqueous sodium hydroxide solution (10 mL, 0.5M), followed by extraction with diethyl ether (2×10 mL, 1×5 mL). After drying of the organic phase with K<sub>2</sub>CO<sub>3</sub> and filtration of the drying agent, the solvent was removed *in vacuo*, affording the desired 2-(aminomethyl)aziridine **10**.

The spectral data of 2-(aminomethyl)aziridines **10a,b,d** have been reported elsewhere.<sup>20,4d</sup>

**1-(2-Methylpropyl)-2-(*N,N*-diethylaminomethyl)aziridine (10c).** Yield 92%. Light-yellow oil. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>): δ 0.89 and 0.93 (6H, 2×d, J=6.7 Hz, CH(CH<sub>3</sub>)<sub>2</sub>); 1.05 (6H, t, J=7.2 Hz, 2×CH<sub>2</sub>CH<sub>3</sub>); 1.25 (1H, d, J=6.3 Hz, N(H<sub>cis</sub>CH)CH); 1.48 (1H, m, CHN); 1.55 (1H, d, J=3.4 Hz, N(HCH<sub>trans</sub>)CH); 1.80 (1H, sept, J=6.7 Hz, CH(CH<sub>3</sub>)<sub>2</sub>); 1.95 and 2.15 (2H, 2×d×d, J=11.6, 7.3, 6.3 Hz, N(HCH)CHMe<sub>2</sub>); 2.42 and 2.58 (2H, 2×d×d, J=13.3, 5.8, 5.7 Hz, NCH(HCH)N); 2.60-2.70 (4H, m, 2×CH<sub>2</sub>CH<sub>3</sub>). <sup>13</sup>C NMR (68 MHz, CDCl<sub>3</sub>): δ 11.7 (2×CH<sub>2</sub>CH<sub>3</sub>); 20.9 and 21.0 (CH(CH<sub>3</sub>)<sub>2</sub>); 29.2 (CH(CH<sub>3</sub>)<sub>2</sub>); 33.5 (NCH<sub>2</sub>CHCH<sub>2</sub>NEt<sub>2</sub>); 37.8 (NCH<sub>2</sub>CHCH<sub>2</sub>NEt<sub>2</sub>); 47.3 (2×CH<sub>2</sub>CH<sub>3</sub>); 56.4 (CH<sub>2</sub>NEt<sub>2</sub>); 69.6 (NCH<sub>2</sub>CHMe<sub>2</sub>). IR (NaCl, cm<sup>-1</sup>): ν = 3035, 1469, 1383, 1070. MS (70 eV) m/z (%): 184 (M<sup>+</sup>, 5); 169 (2); 155 (2); 141 (2); 113 (16); 112 (39); 86 (100); 72 (39); 70 (70); 58 (16); 56 (23). Anal. Calcd for C<sub>11</sub>H<sub>24</sub>N<sub>2</sub>: C 71.68, H 13.12, N 15.20. Found: C 71.84, H 13.29, N 15.11.

**Synthesis of 2-[(alkylsulfanyl)methyl]aziridines 11. General procedure**

To a solution of sodium methoxide (2 equiv) in methanol (0.25N) was added an alkanethiol (3 equiv) at room temperature. After stirring for 30 minutes, aziridine **3** (2 mmol) was added, and the resulting mixture was further stirred for 8 hours at room temperature. The reaction mixture was poured into water (50 mL) and extracted with CH<sub>2</sub>Cl<sub>2</sub> (3×30 mL). The combined organic extracts were washed with water (2×15 mL) and brine (20 mL). Drying (MgSO<sub>4</sub>), filtration of the drying agent and evaporation of the solvent afforded the corresponding 2-[(alkylsulfanyl)methyl]aziridines **11**, which were purified by column chromatography on silica gel (Hexane/EtOAc 4/1).

**1-[(4-Chlorophenyl)methyl]-2-[(isopropylsulfanyl)methyl]aziridine (11a).** Yield 84%. Colorless oil. R<sub>f</sub> = 0.25 (Hexane/EtOAc 4/1). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.22 and 1.24 (6H, 2×d, J=6.5 Hz, 2×CH<sub>3</sub>); 1.47 (1H, d, J=5.9 Hz, N(*H*<sub>cis</sub>CH)CH); 1.72-1.74 (2H, m, CHN and N(HCH<sub>trans</sub>)CH); 2.52 and 2.65 (2H, 2×d×d, J=13.4, 5.9, 5.6 Hz, (HCH)S); 2.92 (1H, sept, J=6.5 Hz, CHMe<sub>2</sub>); 3.38 and 3.44 (2H, 2×d, J=13.5 Hz, N(HCH)Ar); 7.30 (4H, s, CH<sub>arom</sub>). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 23.32 and 23.41 (2×CH<sub>3</sub>); 33.60 (CH<sub>2</sub>S); 34.09 (NCH<sub>2</sub>CH); 34.64 (CHMe<sub>2</sub>); 39.71 (NCH); 63.74 (NCH<sub>2</sub>Ar); 128.41 and 129.43 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 132.76 (CCl); 137.45 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>max</sub> = 1597, 1491, 1462, 1240, 805. MS (70 eV) m/z (%): 255/7 (M<sup>+</sup>, 1); 181 (49); 180/2 (75); 166 (19); 146 (18); 125/7 (100); 99/101 (8); 89 (25); 56 (20). Anal. Calcd for C<sub>13</sub>H<sub>18</sub>ClNS: C 61.04, H 7.09, N 5.48. Found: C 61.18, H 7.25, N 5.32.

**2-[(Allylsulfanyl)methyl]-1-[(4-chlorophenyl)methyl]aziridine (11b).** Yield 60%. Colorless oil. R<sub>f</sub> = 0.33 (Hexane/EtOAc 4/1). <sup>1</sup>H NMR (CDCl<sub>3</sub>, 270 MHz): δ 1.46 (1H, d, J=6.2 Hz, N(*H*<sub>cis</sub>CH)CH); 1.72-1.73 (2H, m, CHN and N(HCH<sub>trans</sub>)CH); 2.46 and 2.57 (2H, 2×d×d, J=13.5, 5.6, 5.6 Hz, NCH(HCH)S); 3.12 (2H, d, J=7.2 Hz, SCH<sub>2</sub>CH=CH<sub>2</sub>); 3.38 and 3.43 (2H, 2×d, J=13.3 Hz, N(HCH)Ar); 5.03-5.08 (2H, m, CH=CH<sub>2</sub>); 5.68-5.81 (1H, m, CH=CH<sub>2</sub>); 7.30 (4H, s, CH<sub>arom</sub>). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 68 MHz): δ 33.55 (NCHCH<sub>2</sub>S); 34.03 (NCH<sub>2</sub>CH); 34.72 (SCH<sub>2</sub>CH=CH<sub>2</sub>); 39.35 (NCH); 63.74 (NCH<sub>2</sub>Ar); 117.16 (CH=CH<sub>2</sub>); 128.44 and 129.43 (NCH<sub>2</sub>HC<sub>ortho</sub>HC<sub>meta</sub>); 132.79 (CCl); 134.19 (CH=CH<sub>2</sub>); 137.41 (C<sub>arom,quat</sub>). IR (NaCl, cm<sup>-1</sup>): ν<sub>max</sub> = 1634, 1597, 1491, 1464, 805. MS (70 eV) m/z (%): 253/5 (M<sup>+</sup>, 3); 183 (34); 181 (61); 180/2 (85); 166 (38); 154 (27); 146 (34); 125/7 (100); 99/101 (24); 89 (38); 56 (28). Anal. Calcd for C<sub>13</sub>H<sub>18</sub>ClNS: C 61.04, H 7.09, N 5.48. Found: C 61.18, H 7.25, N 5.32.

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