

Silicon Effects. V.

 β -Silicon Effect in the Solvolysis of 2-Phenylethyl Compounds¹⁾

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The rates of the solvolysis of 2-aryl-2-(trimethylsilyl)ethyl compounds, $\text{ArCH}(\text{SiMe}_3)\text{CH}_2\text{X}$ (**4**: $\text{X}=\text{Cl}$ and OCOCF_3 ; $\text{Ar}=\text{C}_6\text{H}_5$ and $p\text{-MeOC}_6\text{H}_4$), have been measured in various solvents at 25°C. The solvolysis of the chloride, **4** ($\text{X}=\text{Cl}$; $\text{Ar}=\text{C}_6\text{H}_5$), exhibited an m value of 0.90 in aqueous dioxane consistent with rate-determining ionization; it gave (2-ethoxy-2-phenylethyl) trimethylsilane together with styrene in ethanol indicating a 1, 2-SiMe₃ migration during the solvolysis. The $p\text{-MeO}$ -substitution effect, $k^{p\text{-MeO}}/k^{\text{H}}$, was measured with the trifluoroacetates to be 2.1, in contrast to a factor of 269 observed in solvolysis of 1-aryl-2-(trimethylsilyl)ethyl compounds (**1**), indicating that distinct intermediates are involved in ionization of the two regioisomeric systems, **1** and **4**.

The effect of organosilicon groups in carbocation-forming processes has received wide attention from theoretical and mechanistic interests in recent years.^{2–9)} Theoretical calculations reported by Jorgensen and co-workers³⁾ indicated that the SiH₃-bridged form for the primary cation, $\text{SiH}_3\text{CH}_2\text{CH}_2^+$, is slightly more stable than an open, bisected form by 2.4 kcal mol^{–1} (1 kcal = 4.18 kJ), while the bridged form is ca. 4 kcal mol^{–1} higher in energy than the open form for the secondary cation, $\text{SiH}_3\text{CH}_2\text{C}^+\text{HCH}_3$.

We previously reported the kinetic β -silicon effect in solvolysis of the 1-aryl-2-(trimethylsilyl)ethyl system **1**.¹⁰⁾ In 30% aqueous dioxane at 25°C, 1-phenyl-2-(trimethylsilyl)ethyl trifluoroacetate (**1a-OTFA**) solvolyzed 2.99×10^5 and 1.05×10^5 times more rapidly than did corresponding 3, 3-dimethyl-1-phenylbutyl and 1-phenylethyl compounds, respectively, indicating an acceleration of ca. 10^5 by a $\beta\text{-SiMe}_3$ group relative to a $\beta\text{-H}$ or a $\beta\text{-t-Bu}$ group in ionization of the 1-phenylethyl system. The results of the various mechanistic criteria including solvent effect, substituent effect, deuterium kinetic isotope effect, and activation energies for the system **1** were consistent with the simple ionization mechanism (k_c) via the open benzylic cation **2** rather than the σ -participation mechanism (k_Δ) via the bridged siliconium ion intermediate **3**. Further evidence to confirm the mechanism of ionization of **1** may be provided from the comparison with solvolysis of the regioisomeric system, i. e., 2-phenyl-2-(trimethylsilyl)ethyl compounds (**4**), which may undergo either k_Δ ionization forming **3**, or k_c ionization leading to the primary cation **5** (Chart 1).

This paper describes both kinetic and product studies concerning the solvolysis of 2-phenyl- and 2-(p -methoxyphenyl)-2-(trimethylsilyl)ethyl trifluoroacetates (**4a-OTFA** and **4b-OTFA**) and 2-phenyl-2-(trimethylsilyl)ethyl chloride (**4a-Cl**), and discusses the β -silicon effect in the solvolysis of 1-phenyl- and 2-phenylethyl compounds.

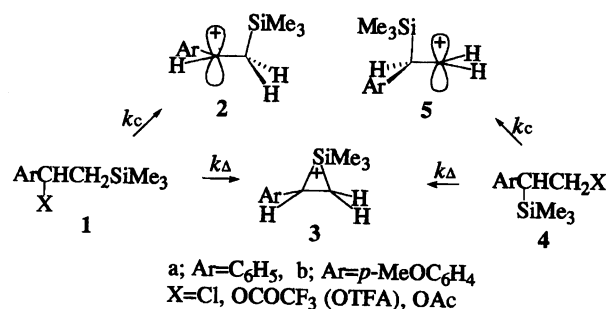


Chart 1.

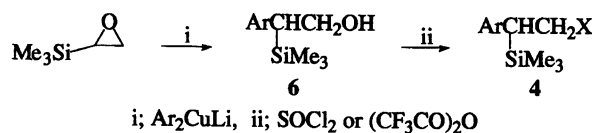


Chart 2.

Results and Discussion

The compounds, **4a-Cl**, **4a-OTFA**, and **4b-OTFA**, were prepared by the treatment of the corresponding alcohols, **6**, with thionyl chloride or trifluoroacetic anhydride;^{5,7)} the alcohols were obtained by the reaction of 2-(trimethylsilyl)oxirane with lithium diphenylcuprate or lithium bis(p -methoxyphenyl)cuprate (Chart 2).

The rates of solvolysis were measured spectrophotometrically at 25.0°C by the method described previously.¹⁰⁾ Table 1 summarizes the results of the solvolysis for **4a-Cl**, **4a-OTFA**, and **4b-OTFA** in various solvents. Table 1 includes the rates of solvolysis for 1-phenyl-2-(trimethylsilyl)ethyl acetate (**1a-OAc**) and a 2- p -methoxyphenyl derivative, **1b-OAc**, for comparison.

We previously showed that the solvolytic reactivities of **1a-OTFA** and $p\text{-Me}$, $m\text{-Cl}$, $p\text{-Br}$, 3, 4-dichloro, and 3, 5-dichloro derivatives were correlated with σ^+ , yielding a ρ^+ value of -3.07 (correlation coefficient $R=0.997$).¹⁰⁾ The substituent effect of a p -methoxyl group observed for the acetates, i.e., $k^{p\text{-MeO}}/k^{\text{H}}=269$ for **1-OAc**, is

Table 1. Rates of Solvolysis for **4a-Cl**, **4a-OTFA**, and **1-OAc** at 25.0±0.05°C

Substrate	Solvent ^{a)}	10 ⁵ <i>k</i> /s ⁻¹
4a-Cl	97T	(1.80±0.05)×10 ⁻² ^{b)}
	60A	(2.94±0.03)×10 ⁻⁴ ^{b)}
	50A	(8.37±0.09)×10 ⁻⁴ ^{b)}
	40A	(2.24±0.007)×10 ⁻³
	60D	(1.65±0.002)×10 ⁻⁴
	50D	(6.34±0.002)×10 ⁻⁴
	40D	(2.12±0.001)×10 ⁻³
	80E	(3.18±0.0009)×10 ⁻⁴
	60E	(1.02±0.0004)×10 ⁻³
	50E	(2.02±0.0008)×10 ⁻³
4a-OTFA	97T	(5.73±0.003)×10 ⁻⁴
	30D	(1.35±0.01)×10 ⁻³ ^{b)}
4b-OTFA	97T	(1.21±0.0005)×10 ⁻³
	30D	(2.88±0.06)×10 ⁻³ ^{b)}
1a-OAc	40D	(5.84±0.007)×10 ⁻⁵
1b-OAc	40D	(1.57±0.01)×10 ⁻²

a) 97T: 97/3 (w/w) trifluoroethanol/water; 60A—40A: 60/40—40/60 (v/v) acetone/water; 60D—40D: 60/40—40/60 (v/v) dioxane/water; and 80E—40E: 80/20—40/60 (v/v) ethanol/water mixtures. b) Average of duplicate determinations.

in good agreement with a predicted value of 248 calculated from the above correlation. The Yukawa-Tsuno treatment (Eq. 1)¹¹ for the eight *m*- and *p*-substituents including the *p*-MeO group gave a good linear correlation expressed as Eq. 2 (*R*=0.998), yielding a ρ value of -3.05 and a resonance parameter *r* value of 0.98, indicating essentially the same resonance demand for 1-phenyl-2-(trimethylsilyl)ethyl cation (**2**) as that for the reference standard, 1-methyl-1-phenylethyl cation (*r*=1.0).

$$\log k^X/k^H = \rho(\sigma^\circ + r\Delta\sigma_R^+) \quad (1)$$

$$\log k^X/k^H = -3.05(\sigma^\circ + 0.98\Delta\sigma_R^+) \quad (2)$$

The products in the solvolysis of the chloride, **4a-Cl**, were determined in buffered ethanol at 50°C. The GLC and NMR analyses of a crude mixture obtained after solvolysis indicated the formation of styrene **7** and (2-ethoxy-2-phenylethyl)trimethylsilane (**8**) at a ratio of 84:16; the latter compound arose from a 1, 2-silyl rearrangement. The result is interestingly compared with the previous finding that the buffered methanolysis of **1-OTFA** (Ar=*m*-ClC₆H₄) gave *m*-chlorostyrene and [2-methoxy-2-(*m*-chlorophenyl)ethyl] trimethylsilane at a ratio of 78:22.¹⁰ The striking resemblance in the products in the two solvolyses suggests a common product-forming step for the two regioisomeric systems, **1** and **4**. The 2-phenylethyl compound, **4a-Cl**, may undergo phenyl-assisted solvolysis via a phenonium ion, **9**; however, the formation of any phenyl-rearranged products, such as **10**, could not be detected. No direct substitution product was formed, either (Charts 3 and 4).

Figure 1 illustrates the dependence of the logarithmic

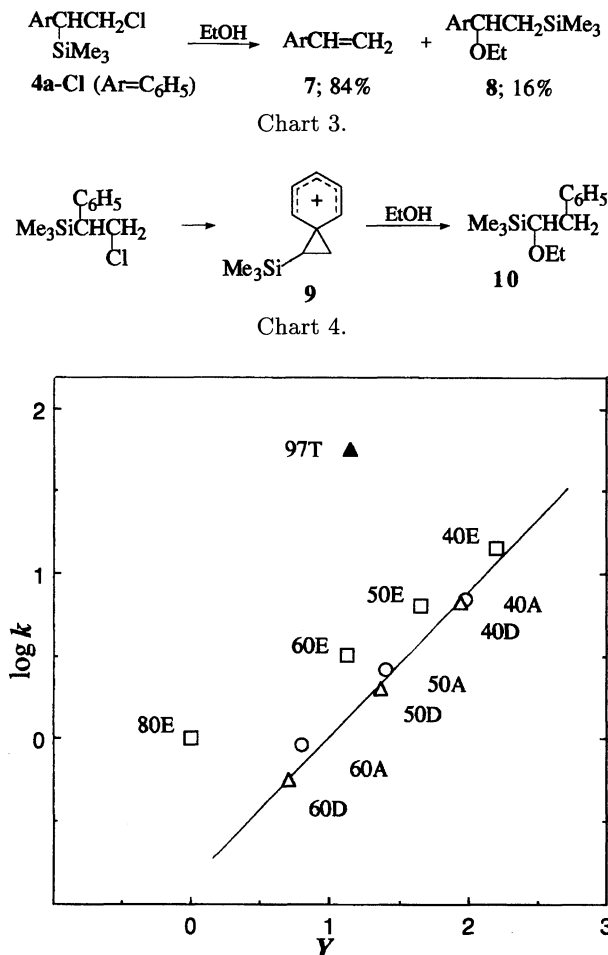


Fig. 1. Plot of log *k* vs. *Y* for solvolysis of 2-phenyl-2-(trimethylsilyl)ethyl chloride (**4a-Cl**) at 25°C in: aq acetone, ○; aq dioxane, △; aq ethanol, □; and aq 2, 2, 2-trifluoroethanol, ▲.

mic rates for **4a-Cl** on solvent ionizing power *Y*.¹² Apparently, **4a-Cl** shows not a single linear response to *Y* but a dispersion for different sets of binary solvent mixtures; *m* values for aqueous dioxane, aqueous acetone, and aqueous ethanol were 0.90 (*R*=0.999), 0.74 (*R*=0.999), and 0.52 (*R*=0.995), respectively. The *m* value of 0.9 for the aqueous dioxane is consistent with ionization in a rate-determining step. A plot against *Y*_{Cl}¹³ in place of *Y* showed a similar dispersion pattern.

The dispersion does not result from inclusion of nucleophilic solvent assistance (*k*_s, **11**). First, direct substitution did not occur even in a strongly nucleophilic solvent, ethanol. Second, 97% aqueous 2, 2, 2-trifluoroethanol (TFE), which is much less nucleophilic than aqueous ethanol, deviates not below but substantially above the aqueous ethanol line, clearly against nucleophilic solvent assistance either at C₁ or at the silicon atom (**12**) in the rate-determining step. Although the dispersion in the solvent effect in the 2-arylethyl systems is often attributable to aryl participation,^{14,15} this is not the case, either. The present system does not involve

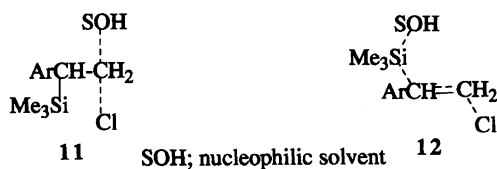


Chart 5.

Table 2. Comparison of Reactivities for **1a-OTFA** and **4a-OTFA**

Substrate	Solvent	k/s^{-1}	k_{rel}
1a-OTFA	30D	36.8 ^{a)}	2.7×10^4
4a-OTFA	30D	1.35×10^{-3}	1.0

a) Reported previously (Ref. 10).



Chart 6.

aryl participation in view of a very small *p*-MeO-substitution effect, i. e., $k(4b-OTFA)/k(4a-OTFA)=2.1$, as well as the absence of the 1, 2-phenyl rearrangement. Thus, the dispersed solvent effect for **4a-Cl** should be interpreted as its intrinsic response to solvent ionizing power. Marked deviation of aqueous TFE above a correlation line for aqueous ethanol has been observed in k_c solvolyses of α -(trialkylsilyl)benzyl tosylates (= *p*-toluenesulfonates) and α -(pentamethyldisilanyl)benzyl halides (Chart 5).⁹⁾

Table 2 compares the reactivity of **4a-OTFA** with that of its regioisomer, **1a-OTFA**; the former solvolyzed 2.7×10^4 times less rapidly than did the latter in 30% aqueous dioxane at 25°C. Since the two regioisomers probably have similar ground state energies, the result suggests that the transition state for the primary system **4** is about 6 kcal mol⁻¹ higher in energy than that for the benzylic system **1**.

Table 3 compares the rate for 2-phenyl-2-(trimethylsilyl)ethyl tosylate (**4a-OTs**) with the phenyl-assisted (k_Δ) and solvent-assisted (k_s) rates of solvolysis for 2-phenylpropyl tosylate (**13**) in 97% TFE reported by Raber et al.¹⁵⁾ The reactivity of the tosylate, **4a-OTs**, was estimated from the rate for the chloride, $k=1.8 \times 10^{-2} s^{-1}$, and a tosylate/chloride rate ratio of 3.7×10^4 .¹⁶⁾ As Table 3 shows, **4a-OTs** solvolyzes 1.3×10^9 times faster than does **13** via aryl participation, indicating that a β -SiMe₃ group is about 12 kcal mol⁻¹ more effective in ionizing the ethyl system than is a β -phenyl group. Since the rate of unassisted ionization (k_c) must be significantly lower than the k_s in the primary system **13**, a $k(4a-OTs)/k_s(13)$ ratio of ca. 10^{11} provides a minimum estimate for the kinetic β -silicon effect of a SiMe₃ group relative to Me on ionization of the 2-phenylethyl system (Chart 6).

Table 3 includes the β -silicon effect in the 1-phen-

Table 3. β -Silicon Effects in Solvolysis of the 2-Phenylethyl- and 1-Phenylethyl Systems

Substrate	Solvent	k/s^{-1} ^{a)}	k_{rel}
4a-Cl	97T	1.80×10^{-2}	
4a-OTs	97T	6.7×10^2 ^{b)}	9.9×10^{10} 1.3×10^9
13 (k_Δ)	97T	5.2×10^{-7} ^{c)}	1.0
(k_s)	97T	6.8×10^{-9} ^{c)}	1.0
1a-OTFA	30D	36.8 ^{d)}	2.99×10^5 1.05×10^5
PhCH(OTFA)CH ₃	30D	3.52×10^{-4} ^{d)}	1.0
PhCHCH ₂ C(CH ₃) ₃	30D	1.24×10^{-4} ^{d)}	1.0

OTFA

a) At 25°C. b) Estimated from the rate for the chloride and a tosylate/chloride rate ratio of 3.7×10^4 (Ref. 16). c) Data taken from Ref. 15; the rates, k_Δ and k_s , were calculated from the observed rate at 25°C and a k_Δ/k_s ratio of 76 at 125°C. d) Reported previously (Ref. 10).

Table 4. Substitution Effect of *p*-Methoxyl Group

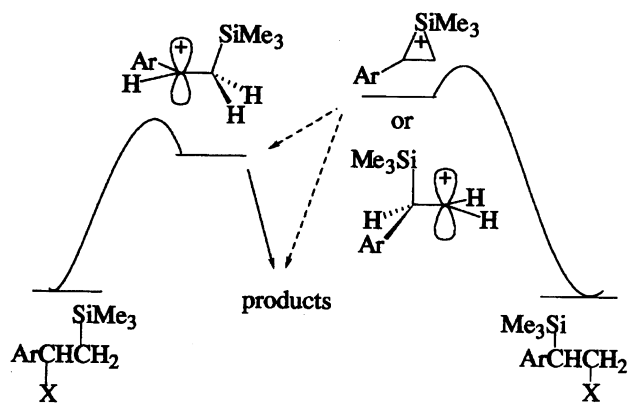
Solvent	k^{p-MeO}/k^H ^{a)}	
	4-OTFA	1-OTFA
97T	2.11	
30D	2.13	
40D		269

a) At 25°C.

ylethyl system for comparison. Accelerations by a β -SiMe₃ group relative to a β -hydrogen and a β -*t*-Bu group were previously quantified to be 1.05×10^5 and 2.99×10^5 , respectively,¹⁰⁾ the result suggests the effect of the β -SiMe₃-group relative to methyl to be a factor of ca. 10^5 . Thus, the combined results indicate that the β -silicon effect on ionization of the 2-phenylethyl system is more than six-orders of magnitude greater than that of the 1-phenylethyl system. This is attributable to a much greater electronic demand of the primary cationic center involved in the former system than that of the benzylic cationic center involved in the latter system. Like kinetic α -methyl and α -phenyl substitution effects in k_c solvolysis,¹⁷⁾ the β -silicon effect must increase with increasing the electronic demands of the relevant carbocationic centers.^{3,18)}

As Table 4 shows, the substituent effect of a *p*-methoxyl group, k^{p-MeO}/k^H , in solvolysis of **4** is quite different from that in solvolysis of **1**, i. e., a k^{p-MeO}/k^H ratio of 269 for **1-OAc**, but only 2.1 for **4-OTFA**. The striking difference in the substituent effect clearly indicates that at least two distinct intermediates are involved in ionization of the regioisomeric systems, **1** and **4**. Pronounced acceleration by the *p*-methoxyl group in the former system is consistent with the previous conclusion that solvolysis occurs by the k_c mechanism via the open benzylic cation **2**.¹⁰⁾

The small k^{p-MeO}/k^H ratio of 2.1 in solvolysis of **4-OTFA** eliminates aryl-assisted ionization, since it should exhibit more pronounced k^{p-MeO}/k^H ratios, i. e., a factor of ca. 10^2 .¹⁴⁾ The inhibition of aryl partici-



Scheme 1.

pation in the 2-arylethyl system, **4**, undoubtedly results from the presence of a β -SiMe₃ group, which is superior in its cation-stabilizing ability to a β -aryl group, as indicated by the $k(4a\text{-OTs})/k_{\Delta}(13)$ ratio of 10^9 (Table 3).

It is instructive to note that the *p*-MeO-substitution effect in the system **4** is essentially the same as that observed in k_c solvolysis of 2-aryl-1, 1-dimethylethyl chlorides (**14**) reported by Brown and Kim, i. e., $k^{p\text{-MeO}}/k^H = 1.51$ in 80% aqueous ethanol at 50°C.^{19,20} This means that the positive charge on the benzylic carbon is marginal in the transition state of ionization of **4-OTFA**. The results are consistent either with $\sigma(\text{CSi})$ -assisted ionization (k_{Δ}) forming the SiMe₃-bridged species, **3**, or with unassisted (k_c) ionization forming the open primary cation **5**. In the latter cation, the C⁺-C-Si bond angle must be significantly narrow compared to a normal angle (109°) as the result of strong $\sigma(\text{CSi})$ - π interaction.³ In view of low stabilities of primary alkyl cations, $\sigma(\text{CSi})$ -assisted ionization seems more likely to occur; however, the energy difference between the two species, **3** and **5**, may be quite small. Recent theoretical calculations indicate that the SiH₃-bridged form for the primary cation, SiH₃CH₂CH₂⁺, is slightly more stable than the open, bisected form by only 2.4 kcal mol⁻¹ (even in the gas-phase), and that for the secondary cation, SiH₃C⁺HCH₃, the open form is lower in energy than the bridged form.³⁾

Whichever mechanism is really operative in solvolysis of the system, **4**, it can be concluded that ionization of the two regioisomeric systems, **1** and **4**, leads to the distinct intermediates in their rate-determining steps, as illustrated in Scheme 1; the structure of the transition state for **1** resembles the open benzylic cation **2**, which is estimated on the basis of the difference in the reactivities between **1** and **4** to be about 6 kcal mol⁻¹ lower in energy than the intermediate formed from **4**, either **3** or **5**. The striking resemblance in the products in the solvolyses of the two regioisomeric systems suggests a common product-forming step from **2**.

Experimental

Proton NMR were recorded in CCl₄ at 60 MHz (Hitachi R-60) and referenced to tetramethylsilane. IR spectra were recorded on a Hitachi R-215 spectrophotometer. Absolute ethanol was distilled twice over sufficient amounts of magnesium ethoxide. Acetone was refluxed with potassium permanganate and distilled; the distillate was dried over potassium carbonate and fractionated. Dioxane was refluxed for 3 d with sodium hydroxide and distilled; the distillate was refluxed for 3 d with metallic sodium, and fractionated. Commercial 2,2,2-trifluoroethanol (Kishida Chemicals) was dried over Molecular Sieves 4A for one week, and distilled over sodium carbonate.

1-Phenyl-2-(trimethylsilyl)ethyl Acetate (1a-OAc). Into a stirred solution of 1-phenyl-2-(trimethylsilyl)ethanol¹⁰⁾ (948 mg) and pyridine (655 mg) in ether (10 cm³) was added an ethereal solution of acetyl chloride (652 mg) over a period of 10 min and the mixture was stirred at ambient temperature for 3 h. A crude oil obtained after a usual workup was purified by column chromatography on silica gel to give 921 mg (82% yield) of the acetate, **1a-OAc**: IR (neat) 1740, 1250, 1220, 1050, and 840 cm⁻¹; ¹H NMR $\delta = -0.10$ (9H, s), 1.17–1.34 (2H, m), 1.94 (3H, s), 5.77 (1H, t, $J = 7.8$ Hz), and 7.25 (5H, almost s). Found: C, 66.10; H, 8.35%. Calcd for C₁₃H₂₀O₂Si: C, 66.05; H, 8.53%.

1-(*p*-Methoxyphenyl)-2-(trimethylsilyl)ethyl Acetate (1b-OAc). Into a solution of (trimethylsilyl)methyl lithium, prepared from (trimethylsilyl)methyl chloride (6.10 g) and lithium (701 mg) in ether (20 cm³) at -50°C, was added *p*-methoxybenzaldehyde (6.45 g) in ether (10 cm³) over a period of 30 min at -50°C, and the mixture was stirred for 1.5 h at that temperature. A solution of acetyl chloride (3.69 g) in ether (10 cm³) was added and the mixture was allowed to warm to room temperature. A crude oil obtained after a usual workup was purified by a bulb-to-bulb distillation (120–130°C at 67 Pa) to give the acetate, **1b-OAc** (860 mg): ¹H NMR $\delta = -0.11$ (9H, s), 1.16–1.31 (2H, m), 1.90 (3H, s), 2.52 (3H, s), 5.72 (1H, t, $J = 7.8$ Hz), and 6.97 (4H, aromatic). Found: C, 63.35; H, 8.21%. Calcd for C₁₄H₂₂O₃Si: C, 63.12; H, 8.33%.

2-Phenyl-2-(trimethylsilyl)ethyl Chloride (4a-Cl) and Trifluoroacetate (4a-OTFA). Into a stirred solution of lithium diphenylcuprate prepared from phenyllithium (0.090 mol) and copper(I) iodide (8.19 g) in ether (200 cm³) was added dropwise 2-(trimethylsilyl)oxirane (2.99 g) at -40°C under argon. The mixture was stirred for 2 h at -40°C and overnight at -15°C. A crude oil obtained after a usual workup was purified by column chromatography on silica gel to give 2-phenyl-2-(trimethylsilyl)ethanol (**6a**, 5.19 g): Mp 65–65.9°C; IR (Nujol) 3200, 1250, 1040, 840, and 690 cm⁻¹; ¹H NMR $\delta = -0.06$ (9H, s), 2.27 (1H, dd, $J = 9.6$ and 5.4 Hz), 3.68–4.13 (2H, m), and 6.9–7.46 (5H, m). Found: C, 67.75; H, 9.18%. Calcd for C₁₁H₁₈OSi: C, 67.99; H, 9.34%. The alcohol was converted into the chloride **4a-Cl** and the trifluoroacetate **4a-OTFA** by the methods described in the literature.^{5a,7)}

4a-Cl: ¹H NMR $\delta = -0.02$ (9H, s), 2.41 (1H, dd, $J = 9.0$ and 5.4 Hz), 3.96–4.40 (2H, m), and 6.85–7.44 (5H, m). Found: C, 62.15; H, 8.09%. Calcd for C₁₁H₁₇ClSi: C, 62.09; H, 8.05%.

4a-OTFA: IR (neat) 1790, 1360, 1250, 1220, 1150, 840,

and 700 cm^{-1} ; $^1\text{H NMR}$ $\delta=0.03$ (9H, s), 2.59 (1H, dd, $J=10.2$ and 5.4 Hz), 4.56–5.05 (2H, m), and 6.90–7.46 (5H, m). Found: C, 53.83; H, 5.98%. Calcd for $\text{C}_{13}\text{H}_{17}\text{F}_3\text{O}_2\text{Si}$: C, 53.78; H, 5.90%.

2-(*p*-Methoxyphenyl)-2-(trimethylsilyl)ethyl Trifluoroacetate (4b-OTFA). The alcohol, 2-(*p*-methoxyphenyl)-2-(trimethylsilyl)ethanol (**6b**) was prepared in a similar procedure to that described for the preparation of **6a** using lithium bis(*p*-methoxyphenyl)cuprate in 77% yield: Mp $52.8\text{--}53.9^\circ\text{C}$; IR (Nujol) 3350 , 1250 , 1200 , and 840 cm^{-1} ; $^1\text{H NMR}$ $\delta=0.0$ (9H, s), 2.28 (1H, dd, $J=9.0$ and 5.4 Hz), 3.78 (3H, s), 3.8–4.0 (2H, m), and 6.65–7.12 (4H, aromatic). Found: C, 64.24; H, 8.98%. Calcd for $\text{C}_{12}\text{H}_{16}\text{O}_2\text{Si}$: C, 64.24; H, 8.98%. The alcohol was converted into the ester **4b-OTFA** by the method described in the literature:^{5a)} $^1\text{H NMR}$ $\delta=0.02$ (9H, s), 2.50 (1H, dd, $J=9.6$ and 6.0 Hz), 3.73 (3H, s), 4.52–4.98 (2H, m), and 6.64–6.99 (4H, aromatic). Found: C, 52.75; H, 6.21%. Calcd for $\text{C}_{14}\text{H}_{19}\text{F}_3\text{O}_3\text{Si}$: C, 52.49; H, 5.98%.

Kinetics. Rates were determined UV spectrophotometrically using $(4\text{--}8)\times 10^{-5}\text{ mol dm}^{-3}$ solutions for the substrates by the same method described previously.^{9,10)} All the solvolysis reactions reported followed excellent first-order kinetics; the rates listed in Table 1 were normally determined from the data points (>100) measured during the first three half-lives ($R>0.99998$).

Ethanolysis of 4a-Cl. Compound **4a-Cl** (0.100 g) was solvolyzed in ethanol (10 cm^3) in the presence of 2,6-lutidine (53 mg, 1.05 equiv) at 50°C for 33 h. A crude oil (83 mg) obtained after a usual workup was a mixture of two compounds in a ration of 84.1:15.9. Each compound was isolated by GLC. The major compound was identified as styrene, and the minor one, as (2-ethoxy-2-phenylethyl)-trimethylsilane (**8**): IR (neat) 1250 , 1080 , and 850 cm^{-1} ; $^1\text{H NMR}$ $\delta=-0.03$ (9H, s), 0.96–1.17 (2H, m), 1.12 (3H, t, $J=7.2$ Hz), 3.22 (2H, q, $J=7.2$ Hz), 4.24 (1H, dd, $J=8.4$ and 6.6 Hz), and 7.20 (5H, almost s). Found: C, 70.29; H, 10.03%. Calcd for $\text{C}_{13}\text{H}_{22}\text{OSi}$: C, 70.21; H, 9.97%.

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