2 × 1 H), 2.00–2.15 (m, 2 × 2 H), 7.14–7.42 (m, 2 × 5 H); ^{13}C NMR ($CDCl_3$) 29.4_2, 30.1_9, 32.7_9, 33.1_8, 33.7_5, 35.7_2, 35.7_7, 36.8_8, 37.6_6, 69.4_1, 69.4_7, 125.3_7, 125.4_6, 125.9_7, 128.1_9, 128.2_8 ppm.

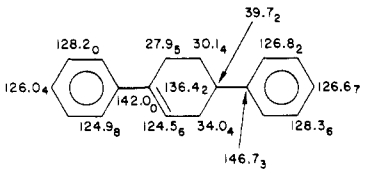
1,4-Dimethyl-4-phenylcyclohexene (10). The epimeric alcohol mixture (10 g) was mixed with 10 g of powdered $KHSO_4$ in a 100-mL round-bottom flask equipped with a Kugelrohr receiver bulb and placed in the Kugelrohr heater. The flask was heated at 150 °C for ca. 1 h which caused water droplets to collect in the receiver. The receiver was changed and aspirator vacuum applied to distill the olefin [bp 150–160 °C (20 mm)]. The product thus collected was redistilled to yield 8.67 g (95%) of olefin **10**: MS, *m/e* 186, 118, 117, 91; ^{1}H NMR ($CDCl_3$) δ 1.24 (s, 3 H), 1.58–1.60 (d, *J* = 3 Hz, 3 H), 1.68–1.81 (m, 2 H), 1.85–1.98 (m, 2 H), 2.02–2.15 (m, 1 H), 2.41–2.83 (m, 1 H), 5.39–5.45 (m, 1 H), 7.11–7.18 (br t, 1 H), 7.23–7.38 (m, 4 H); ^{13}C NMR ($CDCl_3$), see Table I.

1,*c*-4-Dimethyl-*r*-1-phenylcyclohexane (6) and 1,*t*-4-Dimethyl-*r*-1-phenylcyclohexane (7). The olefin **10** (6.5 g, 35 mmol) was dissolved in 50 mL of absolute ethanol in a hydrogenation bottle, 900 mg of 10% Pd on carbon was added, and the mixture was shaken under hydrogen (initial pressure 45 psi) in a Parr apparatus for 1 h. Filtering through a Celite pad, removing the solvent, and distillation of the residue [bp 140–145 °C (20 mm)] in a Kugelrohr yielded 6.1 g (92%) of **6** and **7** in a ratio of ca. 3:2 as shown by GC. This mixture was separated by preparative GLPC using an Apiezon-L column at 170 °C. Compound **6** emerged first followed by **7**.

cis-Isomer **6**: MS, *m/e* 188, 173, 131, 118, 105, 91, and 32. Anal. Calcd for $C_{14}H_{20}$: M^+, 188.157. Found: M^+, 188.157. ^{1}H NMR ($CDCl_3$) δ 0.76–0.82 (d, *J* = 7 Hz, 3 H), 0.96–1.04 (m, 1 H), 1.14 (s, 3 H), 1.2–1.62 (m, 6 H), 2.22–2.50 (m, 2 H),7.1–7.4 (m, 5 H); ^{13}C NMR, see Table I.

trans-Isomer **7**: MS, *m/e* 188, 173, 131, 118, 105, 91. Anal. Calcd for $C_{14}H_{20}$: M^+, 188.157. Found: M^+, 188.157. ^{1}H NMR ($CDCl_3$) δ 0.96–1.00 (d, *J* = 7 Hz, 3 H), 1.1–1.9 (m, 9 H), 1.28 (s, 3 H), 7.2–7.44 (m, 5 H); ^{13}C NMR, see Table I.

Alternate Synthesis of *cis*- (2) and *trans*-1,4-Diphenylcyclohexane (11). The epimeric alcohol mixture of *t*-1,*c*-4-diphenyl-*r*-1-cyclohexanol and *t*-1,*t*-4-diphenyl-*r*-1-cyclohexanol[8] was heated with $KHSO_4$ as described above for **10** to yield 1,4-diphenylcyclohex-1-ene (**12**) in ca. 90% yield, mp 101–103 °C (lit.[14] mp 102 °C) after vacuum distillation in a Kugelrohr: ^{1}H NMR δ 1.96–2.22 (m, 2 H), 2.3–2.7 (m, 4 H), 2.8–3.0 (m, 1 H), 6.18–6.30 (m, 1 H, olefinic), 7.2–7.5 (m, 10 H, Ph); ^{13}C NMR ($CDCl_3$) (in ppm)



12

Catalytic reduction of **12** in absolute ethanol at 45 psi initial hydrogen pressure with 10% by weight of 10% Pd–C yielded *cis*-1,4-diphenylcyclohexane (**2**) of ca. 95% purity as an oil. However, hydrogenation in 95% ethanol using the same catalyst at atmospheric pressure yielded a mixture of **2** and **11**.[15] From the cis–trans mixture the trans (**11**) compound crystallizes from ethanol, mp 171–172 °C (lit.[16] mp 170–172 °C; ^{13}C NMR of **2** and **11**; see Table I.

***cis*-(1,4-Diphenylcyclohexane)chromium Tricarbonyl (1).** *cis*-1,4-Diphenylcyclohexane (**2**) (0.294 g, 1.24 mmol) and $Cr(CO)_6$ (0.824 g, 4.12 mmol) in 20 mL of dioxane were heated at reflux in an argon atmosphere for 20 h. Removal of solvent at reduced pressure left a yellow-green solid, which was dissolved in anhydrous ether and filtered through a filter-aid pad to remove the excess chromium hexacarbonyl. Evaporation of ether at reduced pressure left a residue (0.833 g), which was loaded onto a column of silica gel HF-254 packed in 20% ethyl acetate in hexane. Elution with the same solvent gave complexation product **1** (0.193 g, 42% yield) as a yellow-green oil: IR (CCl_4) 1980, 1910, 1550, 650, 630 cm^{-1}; ^{1}H NMR (CCl_4) δ 1.80 (m, 8 H), 2.55 (br m, 1 H), 2.87 (br m, 1 H), 5.11 (s, 5 H), 7.14 (s, 5 H). ^{13}C NMR, see Table I.[17]

Chromium tricarbonyl complexes **3** and **5** were prepared similarly and were characterized by ^{13}C NMR spectroscopy (Table I).[17]

Acknowledgment. Part of this work was supported by NSF Grant CHE-802088.

Registry No. **1**, 98859-22-4; **2**, 21072-41-3; **3**, 98859-23-5; **4**, 828-45-5; **5**, 98859-24-6; **6**, 98859-17-7; **7**, 98859-18-8; **8**, 98859-19-9; **9**, 98859-20-2; **10**, 98859-21-3; **11**, 21072-42-4; **12**, 10470-07-2; 4-methyl-4-phenylcyclohexanone, 18932-33-7; *t*-1,*c*-4-diphenyl-*r*-1-cyclohexanol, 93783-02-9; *t*-1,*t*-4-diphenyl-*r*-1-cyclohexanol, 93783-03-0.

(14) Alder, K.; Haydn, J. *Justus Liebigs Ann. Chem.* **1950**, *570*, 211.
(15) This observation is in accordance with the fact that higher pressure increases the rate of hydrogenation, which in turn, promotes high stereoselectivity, cf. Eliel, E. L. "Stereochemistry of Carbon Compounds" McGraw-Hill: New York, 1962; p 351.
(16) Bahurel, Y.; Descotes, G.; Sabadie, J. *Bull. Soc. Chim. Fr.* **1968**, 4259.
(17) Since these arenechromium tricarbonyl compounds are air-sensitive amorphous substances of low volatility which are not readily obtained in a state of analytical purity, they were not submitted for elemental analysis.

A Facile Procedure for Oxidative Cleavage of Enolic Olefins to the Carbonyl Compounds with Ruthenium Tetraoxide (RuO_4)

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Oxidative cleavage of a carbon–carbon double bond to the corresponding carbonyl compounds is an essential operation in organic synthesis.[1] Ozonolysis is accepted as the most general method for this purpose, but this technique involves the tedious feature that the reaction is carried out at low temperature by bubbling an excess amount of ozone.[2] On the other hand, among the high valent metal salts suitable for the oxidative cleavage of olefins,[3] ruthenium tetraoxide (RuO_4) is promising with respect to its high efficiency[4] and is already employed in the conversion of simple olefins to the carbonyl compounds.[5] However, to date no systematic study of this application to an enolic system has appeared except for one case attempted in the cleavage of C=C bond of steroidal enamines.[6] In this paper, we disclose a versatile procedure for the oxidative cleavage of enolic olefins including enol ethers, enol acetates, and enamines to give

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(2) (a) Fieser, L. F.; Fieser, M. In "Reagents for Organic Synthesis"; John Wiley and Sons: New York, 1967; Vol. 1, p 773. (b) Below, J. S. In "Oxidation"; Augustine, R. L., Ed.; Marcel Dekker: New York, 1969; Vol. 1, Chapter 6.
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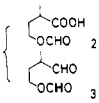
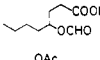
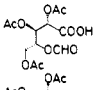
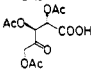
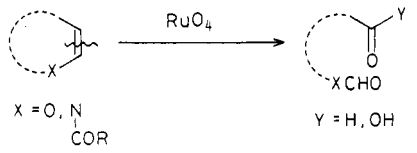
Table I. Oxidative Cleavage of Enolic Olefins with RuO_2–$NaIO_4$[a]

entry	substrate	$NaIO_4$ (mmol)	time (h)	product (yield, %)[b]
1	 1	2.1	40	 2 (53) 3 (27)
2	1	4	50	 4 (96)
3	 5	4	10	 6 (93)
4	 7	4	10	 8 (97)
5	7	6	40	 9 (96)
6	 10	4	20	 11 (35)
7	 12	6	10	 13 (96)
8	 15	5	30	 16 (45)
9	 17	4	10	 18 (96)
10	 19	4	10	 20 (91)

[a] Oxidations were carried out by using 1.0 mmol of the substrate in a suspension of CCl_4 (10 mL) and H_2O (10 mL) in the presence of $RuO_4 \cdot 2H_2O$ (4 mg, 0.024 mmol) and $NaIO_4$ under vigorous stirring. [b] Yields based on isolated products.

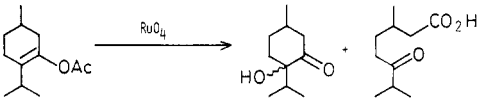
the corresponding carbonyl compounds with RuO_4 under mild conditions.



The oxidation of enolic olefins was carried out in carbon tetrachloride–water (1:1) in which sodium metaperiodate ($NaIO_4$) was used as a stoichiometric oxidant for the regeneration of RuO_4 from RuO_2 present only in a catalytic amount.[7] A number of cyclic enol ethers and enamines were subjected to the oxidation with RuO_4 and the results are summarized in Table I. In general, the cleaved products are obtained in excellent yields.

The product selectivity of this reaction is strongly dependent on the amount of $NaIO_4$ used as a cooxidant. For example, a mixture of aldehyde **3** (27%) and carboxylic acid **2** (53%) was obtained when dihydropyran **1** was oxidized with 2.1 equiv of $NaIO_4$ (entry 1), while oxidation of the same substrate **1** with 4 equiv of $NaIO_4$ for an extended period afforded the lactone **4** in 96% yield, presumably as a result of the cyclization of the corresponding γ-formyloxy carboxylic acid **2** under slightly acidic conditions (entry 2). These results demonstrate that it is difficult to produce the initially formed aldehyde selectively. Therefore, oxidation was performed by taking prolonged reaction times with an excess amount of $NaIO_4$ in order to ensure complete conversion to the product in the highest oxidation state. The exhaustive oxidation of α-D-glucal triacetate **7** with RuO_4 in the presence of a large excess amount of $NaIO_4$, however, produced keto acid **9**, exclusively. Formation of **9** can be understood in terms of overoxidation of the formyloxy carboxylic acid **8**, since the treatment of **8** with RuO_4 under the conditions of entry 5 afforded **9** in 90% yield (entries 4 and 5). By analogy, *N*-acyl enamines **17** and **19** were also oxidized to the corresponding carbonyl compounds **18** and **20**, respectively, in good yields.

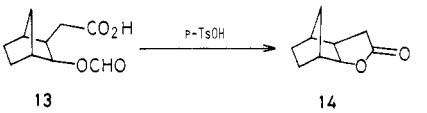
It is interesting to note that the oxidation of enol acetate **21** with RuO_4 in the presence of 3 equiv of $NaIO_4$ afforded a mixture of α-hydroxy ketone **22** (53%) and the keto acid



21 22 23

23 (44%), while treatment of the hydroxy ketone **22** with RuO_4 in the same manner as above resulted in a mixture of **23** (9%) and the unchanged **22** (89%). However, the oxidation of **21** in a stoichiometric manner employing an excess amount of RuO_4 pregenerated from a mixture of RuO_2 (2 equiv) and $NaIO_4$ (4 equiv) provided **23** in 80% yield along with **22** in 16% yield.[13] The formation of **23** from **21** is explained by assuming that **23** may be produced by the direct cleavage of the C=C bond of **21** with RuO_4. On the other hand, it is plausible that the conversion of **21** into **22** would occur by an oxidizing reagent which lies between octavalent and tetravalent oxidation states as ruthenium oxides.[14]

Finally, the γ-formyloxy carboxylic acid **13** was converted into the γ-lactone **14** on heating with *p*-toluene-



13 14

sulfonic acid (*p*-TsOH) in benzene. The present γ-lactone synthesis constitutes a viable alternative method to the reported one, since the starting 3,4-dihydro-2*H*-pyrans are easily accessible from olefins and α,β-unsaturated aldehyde by the hetero-Diels–Alder reaction.[9]

Experimental Section

Melting point ranges are uncorrected and boiling point ranges are indicated by an air-bath temperature without correction. IR spectra were recorded with a JASCO IRA-1 grating spectrometer. Unless otherwise noted, ^1H NMR spectra were determined at 60 MHz with a Hitachi R-24 spectrometer. Optical rotations were taken on a JASCO DIP-140 digital polarimeter in chloroform. Elemental analyses were performed in our laboratory.

Materials. According to the reported methods,[9] 2,3-disubstituted 3,4-dihydro-2*H*-pyrans **5**, **10**, and **12** were prepared by the hetero-Diels–Alder reaction of α,β-unsaturated aldehydes with olefins. Bicyclic enol ether **15**[10] and enamine **19**[11] were prepared by the reported procedures. *N*-Acyl enamine **17** was obtained by the electrochemical methoxylation of the carbamate followed

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by the demethoxylation with ammonium bromide.[12]

General Procedure for the Oxidative Cleavage of Enol Ethers with RuO_4. To a suspension of α-D-glucal triacetate **7** (270 mg, 1 mmol) dissolved in CCl_4 (10 mL) and $NaIO_4$ (857 mg, 4 mmol) dissolved in water (10 mL) was added $RuO_2 \cdot 2H_2O$ (4 mg, 0.024 mmol). After vigorous stirring for about 10 h, the reaction was quenched with isopropyl alcohol. The organic layer was separated and the aqueous layer was extracted several times with AcOEt. The combined extracts were dried (Na_2SO_4) and the concentrated residue was purified by column chromatography (SiO_2, hexane–AcOEt, 1/1) to give 299 mg (97%) of **8**: mp 128–129 °C: $[\alpha]_D^{17}$ +29.18° (*c* 2.45); IR (Nujol) 3280–2600 (COOH), 1768, 1755, 1748, 1730, 1700 (ester C=O), 1380, 1260, 1240, 1202, 1145, 1110, 1062, 1040, 950, 928, 845, 760 cm^{-1}; ^1H NMR ($CDCl_3$) δ 2.09, 2.14, 2.19 (s, 9, CH_3C=O), 4.27 (m, 2, CH_2O), 5.27–5.83 (m, 3, CHO), 8.05 (s, 1, OCHO), 8.36 (br s, 1, COOH). Anal. Calcd for $C_{12}H_{16}O_{10}$: C, 45.01; H, 5.04. Found: C, 44.96; H, 5.09.

Similar treatment of **7** with a mixture of $RuO_2 \cdot 2H_2O$ (4 mg, 0.024 mmol) and $NaIO_4$ (1286 mg, 6 mmol) for 40 h provided keto acid **9** (276 mg, 96%) which was characterized after esterification with CH_2N_2: (Me ester of **9**) mp 56–57 °C: $[\alpha]_D^{17}$ −10.31° (*c* 6.00); IR (neat) 1750 (ester C=O), 1375, 1220, 1070 cm^{-1}; ^1H NMR ($CDCl_3$) δ 2.15 (s, 6, CH_3COO), 2.17 (s, 3, CH_3COO), 3.75 (s, 3, OCH_3), 4.85 (d, *J* = 2 Hz, 2, CH_2O), 5.59 (d, *J* = 2.5 Hz, 1, OCHCO), 5.73 (d, *J* = 2.5 Hz, 1, OCHCOO). Anal. Calcd for $C_{12}H_{16}O_9$: C, 47.38; H, 5.30. Found: C, 47.31; H, 5.33.

Conversion of 8 into 9. A mixture of **8** (160 mg, 0.5 mmol), $RuO_2 \cdot 2H_2O$ (3 mg, 0.02 mmol), and $NaIO_4$ (642 mg, 3.0 mmol) was added to CCl_4 (10 mL) and H_2O (10 mL). The resulting suspension was vigorously stirred for 45 h and the products were taken up in AcOEt. Usual workup followed by column chromatography (SiO_2, hexane–AcOEt, 1/1) gave 130 mg (90%) of **9**.

Results of the oxidation of enolic olefins with RuO_4 are given in Table I and physical properties along with spectral data of products are as follows.

6: bp 139–141 °C (1 mm); IR (neat) 3600–2400 (COOH), 1720 (C=O), 1410, 1180, 1085 cm^{-1}; ^1H NMR ($CDCl_3$) δ 0.90 (m, 3, CH_3), 1.10–2.75 (m, 10, CH_2), 5.05 (m, 1, CHO), 8.09 (s, 1, OCHO). Anal. Calcd for $C_9H_{16}O_4$: C, 57.43; H, 8.57. Found: C, 57.52; H, 8.51.

11: bp 128–130 °C (2 mm); IR (neat) 1740 (C=O), 1715 (C=O), 1405, 1355, 1210, 1170, 965 cm^{-1}; ^1H NMR ($CDCl_3$) δ 1.00–1.75 (m, 7, CH_2, CH), 1.90–2.75 (m, 4, CH_2, CH), 2.13 (s, 3, CH_3C=O), 4.85 (d, *J* = 6 Hz, 1, CHO), 7.95 (s, 1, OCHO). Anal. Calcd for $C_{11}H_{16}O_3$: C, 67.32; H, 8.22. Found: C, 67.30; H, 8.27.

13: bp 144–146 °C (2 mm); IR (neat) 3400–2300 (COOH), 2640 (CHO), 1720 (C=O), 1695 (COOH), 1460, 1405, 1300, 1245, 1170, 900, 680 cm^{-1}; ^1H NMR ($CDCl_3$) δ 1.00–2.50 (m, 11, CH_2, CH), 4.90 (m, CHO), 7.98 (s, 1, OCHO), 10.48 (s, 1, COOH). Anal. Calcd for $C_{10}H_{14}O_4$: C, 60.59; H, 7.12. Found: C, 60.62; H, 7.19.

16: mp 54–55 °C; IR (Nujol) 1715 (C=O), 1697 (C=O), 1455, 1378, 1255, 1060, 1010, 1000 cm^{-1}; ^1H NMR ($CDCl_3$) δ 0.96 (d, *J* = 7 Hz, 6, CH_3), 1.10–2.00 (m, 4, CH_2, CH), 2.00–2.80 (m, 6, CH_2), 3.47–4.55 (m, 2, CH_2O). Anal. Calcd for $C_{11}H_{18}O_3$: C, 66.64; H, 9.15. Found: C, 66.59; H, 9.16.

18: bp 146–150 °C (2 mm); IR (neat) 3640–2400 (COOH), 1732 (C=O), 1705 (C=O), 1690 (C=O), 1320, 1270, 1230, 1185, 1012, 772 cm^{-1}; ^1H NMR ($CDCl_3$) δ 1.13–1.50 (m, 6, CH_3), 1.80–2.50 (m, 4, CH_2), 4.07–4.74 (m, 3, CH_2, CH), 9.21 (br s, 2, CHO, COOH). Anal. Calcd for $C_9H_{15}O_5$: C, 49.76; H, 6.96. Found: C, 49.76; H, 6.86.

20: bp 139–142 °C (2 mm); IR (neat) 1740 (C=O), 1712 (C=O), 1695 (C=O), 1385, 1372, 1247, 1178, 1170, 1045, 920, 732 cm^{-1}; ^1H NMR ($CDCl_3$) δ 1.02 (d, *J* = 6 Hz, 3, CH_3), 1.55–2.84 (m, 11, CH_2, CH), 2.38 (s, 3, CH_3C=O), 3.70–4.03 (m, 2, CH_2NC=O). Anal. Calcd for $C_{12}H_{19}NO_3$: C, 63.98; H, 8.50. Found: C, 63.90; H, 8.52.

Cleavage of Enol Acetate 21 with a Stoichiometric Amount of RuO_4. To a cooled (0 °C) solution of menthone enol acetate **21** (196.3 mg, 1 mmol) in CCl_4 (10 mL) was added dropwise a yellow solution of RuO_4 generated from $RuO_2 \cdot 2H_2O$ (338 mg, 2 mmol) and $NaIO_4$ (856 mg, 4 mmol) in CCl_4 (50 mL). The mixture was stirred for 1 h at 0–5 °C and the reaction was quenched with isopropyl alcohol (1 mL). The mixture was freed from RuO_2 by filtration under reduced pressure and the filtrate was concentrated to give a mixture of **22**[13] (29 mg, 16%) and **23** (160 mg, 80%) after purification on column chromatography (SiO_2, hexane–AcOEt, 4/1).

Treatment of 22 with RuO_4 Regenerated from $RuO_2 \cdot 2H_2O$ (Catalytic) and $NaIO_4$ (Stoichiometric). Hydroxy ketone **22** (100 mg, 0.66 mmol), $NaIO_4$ (561 mg, 2.62 mmol), and $RuO_2 \cdot 2H_2O$ (3 mg, 0.02 mmol) were placed in CCl_4 (10 mL) and H_2O (10 mL). The mixture was stirred vigorously for 1 h at 0–5 °C and quenched with 2-propanol (0.5 mL). Extractive workup followed by column chromatography (SiO_2, hexane–AcOEt, 2/1) gave 89 mg (89%) of **22** and 10 mg (9%) of **23**.[13]

Lactonization of Formyloxy Carboxylic Acid. A solution of **13** (66 mg, 0.33 mmol) and a catalytic amount of *p*-TsOH in benzene (1 mL) was heated to reflux for 30 min. The mixture was washed with aqueous $NaHCO_3$ and dried (Na_2SO_4). Evaporation followed by column chromatography (SiO_2, hexane–AcOEt, 1/1) gave 41.6 mg (82%) of lactone **14**: bp 105–107 °C (1 mm); IR (neat) 1775 (lactone C=O), 1460, 1415, 1365, 1310, 1215, 1175, 1115, 1045, 1030, 890, 875, 785, 685 cm^{-1}; ^1H NMR ($CDCl_3$) δ 1.00–2.90 (m, 11, CH_2, CH), 4.48 (m, 1, OCH). Anal. Calcd for $C_9H_{12}O_2$: C, 71.03; H, 7.95. Found: C, 70.96; H, 7.97.

Registry No. **1**, 2270-61-3; **2**, 94924-63-7; **3**, 64833-76-7; **4**, 1679-47-6; **5**, 60443-97-2; **6**, 94924-64-8; **7**, 2873-29-2; **8**, 94924-61-5; **9**, 98919-96-1; **9** (methyl ester), 98839-00-0; **10**, 98838-97-2; **11**, 98838-98-3; **12**, 69486-16-4; **13**, 98838-99-4; **14**, 5963-22-4; **15**, 94924-57-9; **16**, 94924-51-3; **17**, 94924-59-1; **18**, 94924-54-6; **19**, 94924-60-4; **20**, 94924-55-7; **21**, 20144-45-0; **22**, 74219-28-6; **23**, 589-60-6; RuO_4, 20427-56-9.

An *N*-Carboxyanhydride (NCA) Route to Aspartame†

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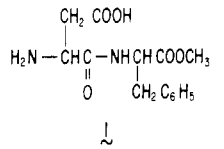
α-L-Aspartyl-L-phenylalanine methyl ester **1** (aspartame) is a nutritive sweetener approximately 200 times as sweet as sucrose.[1] Since the discovery in 1969, much effort has been directed toward an efficient synthesis.[2]



The selective formation of a peptide bond in the α-position of the L-aspartic acid moiety poses a major challenge to the synthesis of aspartame. It has been shown that the ring-opening reaction of N-substituted L-aspartic anhydride **2** with L-phenylalanine or its methyl ester **3** gives a mixture of α- and β-adducts **4** and **5**, with a predominance of the α-isomer[2] (Scheme I). Therefore, a separation/recovery step is required.[2] On the other hand, several regioselective routes to the α-dipeptide have also been reported by either enzymatic[3a,b] or chemical methods.[3c] For example, the approach by Vinick[3c] et al. involves the coupling of L-phenylalanine methyl ester **3** and L-aspartic acid *N*-thiocarboxyanhydride (NTA) **6**, which was prepared from L-aspartic acid and methyl ethyl xanthate followed by PBr_3 cyclization.

We now wish to report our discovery of a simple and regioselective synthesis of aspartame from β-methyl-L-aspartate *N*-carboxyanhydride **7** (NCA) (Scheme II). This

† After this work had been completed in our laboratory, a similar but independent result was recently reported in a patent application (*Chem. Abstr.* **1985**, *102*, 96095*h*).

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