s, 3055, 3020, 2985 sh, 2955 s, 2925 s, 2860, 2825, 1630 s, 1605 s, 1585, 1560, 1540 s, 1470 sh, 1455, 1435, 1430 sh, 1380 sh, 1375, 1370 sh, 1355, 1295, 1275, 1260 s, 1245, 1220 w, 1205, 1180, 1155, 1125 w, 1120 w, 1105 w, 1080 w, 1060 w, 1040 w, 1025, 1020 sh, 1010 w, 970 s, 955, 890 w, 860, 840, 835 sh, 825 w, 785, 740, 720.

13-cis-N-(4-Hydroxyphenyl)retinamide (IVc). Mass spectrum (relative intensity ≥ that of fragment *m/z* 239), *m/z* 392 (M + 1), 391 (M), 376 (M - CH_3), 283 (M - NHC_6H_4OH), 282 (M - HNC_6H_4OH - H), 268 (M - 2,6,6-trimethylcyclohexenyl), 267 (282 - CH_3), 256, 255 (M - $CONHC_6H_4OH$), 254, 241 (M - CH_3 - $CONHC_6H_4OH$ + H), 240, 239, 227, 225 (240 - CH_3), 213, 211, 203, 202, 201, 200; IR (4000-700 cm^{-1}) 3305 s, 3060, 3200-3010 (broad), 2990, 2950, 2920, 2885, 2860, 2820, 1630 s, 1620 sh, 1605 s, 1590, 1565 sh, 1550 s, 1510 s, 1470 w, 1435 s, 1370 sh, 1360, 1355 sh, 1310 s, 1260, 1230 s, 1190, 1180, 1170 sh, 1125 w, 1115 w, 1105 w, 1040, 1010 w, 985, 970 s, 960, 920, 885, 860, 830 s, 805, 795, 760, 705.

13-cis-N-(2-Hydroxyethyl)retinamide (IVd). Mass spectrum (relative intensity ≥ that of fragment *m/z* 241), *m/z* 344 (M + 1), 343 (M), 328 (M - CH_3), 325 (M - H_2O), 324, 310 (M - CH_3 - H_2O), 282 (M - $HNCH_2CH_2OH$ - H), 267 (282 - CH_3), 256, 255 (M - $CONHCH_2CH_2OH$), 241 (M - CH_3 - $CONHCH_2CH_2OH$ + H), 240, 239, 225 (240 - CH_3), 220 (M - 2,6,6-trimethylcyclohexenyl), 213, 211, 207, 206, 202, 201, 200 (also, 298 (M - CH_2CH_2OH), less intense than *m/z* 241); IR (4000-700 cm^{-1}) 3375 s, 3290 broad, 3140 broad, 3060, 3030, 2985 sh, 2940 sh, 2925 s, 2905, 2860, 2825, 1655, 1620 s, 1605, 1585 s, 1575 sh, 1560, 1550, 1520 s, 1505 sh, 1460, 1450, 1445, 1425, 1380, 1370, 1360, 1330 w, 1300, 1270, 1260 s, 1245 s, 1215, 1200, 1175, 1160, 1125, 1115 w, 1100 w, 1090, 1075, 1060 sh, 1050 s, 1040, 1025, 980 sh, 975 s, 960, 935 sh, 900 w, 895, 870, 860 sh, 840, 830, 820, 795, 735, 720 sh.

13-cis-N-(4-Hydroxybutyl)retinamide (IVe). Mass spectrum (relative intensity ≥ that of fragment *m/z* 240), *m/z* 371 (M), 356 (M - CH_3), 282 (M - HNC_4H_8OH - H), 267 (282 - CH_3), 255 (M - $CONHC_4H_8OH$), 241 (M - CH_3 - $CONHC_4H_8OH$ + H), 240, 239, 235, 234, 225 (240 - CH_3), 213, 211, 201; significant MS peaks less intense than *m/z* 240, *m/z* 372 (M + 1), 338 (M - CH_3 - H_2O), 298 (M - C_4H_8OH), 248 (M - 2,6,6-trimethylcyclohexenyl); IR (4000-900 cm^{-1}) 3400 broad sh, 3290 broad, 3060, 3025, 2925 s, 2860, 2820, 1630 s, 1605 s, 1580, 1560, 1530 broad, 1465 sh, 1455 sh, 1445-1430 broad, 1375, 1355, 1270, 1260, 1245, 1200, 1175 w, 1155 w, 1125 w, 1110 w, 1080 sh, 1055, 1025, 970 s.

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Registry No. IIa, 33631-42-4; IIb, 33631-41-3; IIc, 33631-44-6; IId, 33631-47-9; IIe, 65646-90-4; IIf, 85551-22-0; IIg, 75664-71-0; IIh, 75664-74-3; IIi, 85551-23-1; IIj, 74193-15-0; IIk, 81425-66-3; IIl, 71407-30-2; IIm, 65646-68-6; IIn, 75664-77-6; IIIc, 85610-79-3; IVa, 75686-04-3; IVb, 84680-30-8; IVc, 75686-07-6; IVd, 75686-05-4; IVe, 84680-31-9.

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Syntheses of 1-Phenyl-2-(4(1*H*)-Quinazolinylidene)ethanone and Related Ethanones

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Eleven 1-phenyl-2-(4(1*H*)-quinazolinylidene)ethanones were synthesized by the condensation of 4-methylquinazoline and the requisite methyl benzoate ester with sodium hydride as the condensing agent. Substitutents in the 3- or 4-positions of the phenyl ring were chloro, dimethylamino, methoxy, methyl, and trifluoromethyl.

In connection with our interest in enolizable ketones (*1*) we recently had need of some 1-phenyl-2-(4(1*H*)-quinazolinylidene)ethanones which carried substituents in the 3- or 4-position of the phenyl moiety, the substituents being chloro, dimethylamino, methoxy, methyl, and trifluoromethyl (Figure 1). The parent compound has been prepared by Higashino (*2*) and Singh et al. (*3*, *4*). Singh et al. (*3*, *4*) also prepared the 4-methoxy and 4-methyl compounds. The method of Rauch et al. (*5*) was found to be a suitable procedure to produce the requisite ketones in adequate yield.

Table I lists the 1-phenyl-2-(4(1*H*)-quinazolinylidene)-ethanones prepared as well as the melting points and yields.

Experimental Section

The 2-methylquinazoline was prepared by the method of Schofield and Swain (*6*). The substituted benzoic acids were

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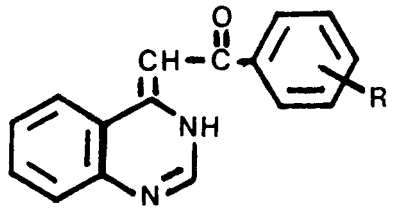

Figure 1.

Table I. 1-Phenyl-2-(4(1*H*)-quinazolinylidene)ethanone[a]

R	yield, %	mp, °C
H	15	159-160[b]
3-Cl	69	191.5-192.5
4-Cl	48	234.5-235.5
3-$(CH_3)_2N$	55	208-209
4-$(CH_3)_2N$	46	237.5-238.5
3-CH_3O	26	192.5-193.5
4-CH_3O	quant	146-147[c]
3-CH_3	30	153-154
4-CH_3	80	177.5-178.5[d]
3-CF_3	24	198.5-199.5
4-CF_3	62	169.5-170.5

[a] Elemental analyses for C, H, and N in agreement with theoretical values were obtained and submitted for review. [b] Reported mp: 160-161 (*2*), 149 (*4*). [c] Reported mp: 145-146 (*4*). [d] Reported mp: 176 (*4*).

obtained commercially and were converted into the individual methyl esters by the method of Clinton and Laskowski (*7*). Elemental analyses were performed by Huffman Microanalytical Laboratories, Wheatridge, CO 80033. Melting points were determined on a Thomas-Hoover melting point apparatus and were corrected. Yields represent single preparations and the yields increased as experience in the preparations was gained. The following example will illustrate the synthesis of the 1-phenyl-2-(4(1*H*)-quinazolinylidene)ethanones.

For 1-(4-chlorophenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 15 mL of anhydrous toluene and 4.80 g (0.10 mol) of sodium hydride (50% oil dispersion) were placed in a stirred flask. 4-Methylquinazoline (2.88 g (0.02 mol) in 25 mL of anhydrous toluene) was added, and the reaction mixture was heated to 70 °C. A solution of 3.40 g (0.02 mol) of methyl 4-chlorobenzoate in 4 mL of anhydrous toluene was added dropwise while maintaining the temperature at approximately 70 °C. The reaction mixture was heated to reflux, refluxed overnight, and cooled in an ice bath. Acetic acid (15 mL) was cautiously added dropwise, followed by 15 mL of a 50–50 acetic acid–water mixture, added in a similar manner. With caution initially, 20 mL of water was then added to the reaction mixture. If at this point some of the sodium salt of 1-(4-chlorophenyl)-2-(4-(1*H*)-quinazolinylidene)ethanone had not completely dissolved, it was dissolved by the addition of a small amount of acetic acid. The toluene layer was separated, dried, and rotary evaporated, resulting in the formation of the product. A total quantity of 2.70 g (48% yield) of 1-(4-chlorophenyl)-2-(4(1*H*)-quinazolinylidene)ethanone was obtained, which after several recrystallizations from toluene had a melting point of 234.5–235.5 °C. The NMR spectrum in $DCCl_3$ showed the following assignments: a broad singlet centered at δ 15.18 (1 H) for the hydrogen-bonded N–H proton; a multiplet at δ 8.10–7.44 (9 H) for the aromatic protons; a singlet at δ 6.72 (1 H) for the methine proton. This is in agreement with the work of Singh et al. (*4*), whose paper appeared during our investigation, who showed that these compounds exist only in the enamine tautomer. Elemental analyses (C, H, and N) in agreement with theoretical values were obtained and submitted for review.

Registry No. 1-Phenyl-2-(4(1*H*)-quinazolinylidene)ethanone, 65961-73-1; 1-(3-chlorophenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 85957-39-7; 1-(4-chlorophenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 73841-72-2; 1-(3-(dimethylamino)phenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 85957-40-0; 1-(4-(dimethylamino)phenyl)-2-4(1*H*)-quinazolinylidene)ethanone, 85957-41-1; 1-(3-methoxyphenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 85957-42-2; 1-(4-methoxyphenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 69270-05-9; 1-(3-methylphenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 85957-43-3; 1-(4-methylphenyl)-2-(4(1*H*)-quinazolinylidene)ethanone, 69270-04-8; 1-(3-(trifluoromethyl)phenyl)-2-(4-(1*H*)-quinazolinylidene, 85957-44-4; 1-(4-(trifluoromethyl)phenyl)-2-(4-(1*H*)-quinazolinylidene)ethanone, 85957-45-5; 4-methylquinazoline, 700-46-9; methyl benzoate, 93-58-3; methyl 3-chlorobenzoate, 2905-65-9; methyl 4-chlorobenzoate, 1126-46-1; methyl 3-(dimethylamino)benzoate, 16518-64-2; methyl 4-(dimethylamino)benzoate, 1202-25-1; methyl 3-methoxybenzoate, 5368-81-0; methyl 4-methoxybenzoate, 121-98-2; methyl 3-methylbenzoate, 99-36-5; methyl 4-methylbenzoate, 99-75-2; methyl 3-(trifluoromethyl)benzoate, 2557-13-3; methyl 4-(trifluoromethyl)benzoate, 2967-66-0.

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