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Reactions of Indoles with 2- and 4-Hydroxybenzyl Alcohols

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Abstract—A procedure has been proposed for the synthesis of 1*H*-indolylmethylphenols by reaction of hydroxybenzyl alcohols with indoles under conditions implying thermal generation of *o*- and *p*-methylenequinones. The mechanism of formation and spectral parameters of the products are discussed.

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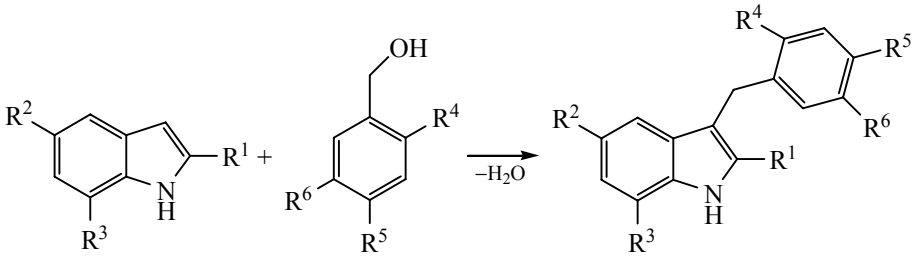
Direct alkylation of indoles with *o*- and *p*-methylenequinones could provide a procedure for the introduction of *o*- and *p*-hydroxybenzyl groups into indole molecules. This structural fragment is present in molecules of some alkaloids [1, 2], and the reaction attracts considerable interest due to wide occurrence of indole compounds in nature.

Methylenequinones are reactive intermediates that are formed from different precursors by the action of high temperature, irradiation, acids, bases, or enzymes [3]. Methylenequinones in organisms are generated mainly following enzymatic path from polyphenolic compounds supplied by vegetable food. Owing to pronounced electrophilic character, they readily react with various nucleophiles, including indoles [4]. Published data on reactions of methylenequinones with indoles are contradictory; these reactions were reported to produce either 1*H*-indolylmethylphenols or 5a,6,10b,11-tetrahydrochromeno[2,3-*b*]indoles [5–21]. With a view to estimate substituent effect on the direction of alkylation of indoles, in the present work we examined in more detail the reaction of indoles with hydroxybenzyl alcohols.

Indolylmethylphenols **Ia**–**Ik** were synthesized in two ways: an equimolar mixture of substituted indole and hydroxybenzyl alcohol was heated for 20 min at 160–165°C under solvent-free conditions or for 6 h in boiling dimethylformamide (Scheme 1). After purification by column chromatography, the yield of compounds **Ia**–**Ik** ranged from 29 to 84%. It should be noted that the presence of electron-withdrawing substituents in molecules of hydroxybenzyl alcohols favored increased yield of indolylmethylphenols due to higher electrophilicity of the corresponding methylenequinones (Table 1). Initial 2-(1-adamantyl)-1*H*-indoles **IIa**–**IId** were synthesized from bromomethyl 1-ada-

Scheme 1.



Ia–Ik

I, R^4 = OH (**a**–**g**), R^3 = F (**b**), R^2 = I, R^6 = Br (**c**), R^1 = 1-Ad (**d**), R^1 = 1-Ad, R^6 = Br (**e**), R^1 = 1-Ad, R^6 = NO_2 (**f**), R^1 = 1-Ad, R^2 = CH_3 (**g**); R^5 = OH (**h**–**k**), R^1 = 1-Ad (**h**), R^1 = 1-Ad, R^6 = CHO (**i**); R^1 = 1-Ad, R^2 = CH_3 (**j**), R^1 = 1-Ad, R^3 = CH_3 (**k**); R^n = H unless otherwise stated.

Table 1. Yields, melting points, and elemental analyses of 2- and 4-(1*H*-indolylmethyl)phenols **Ia**–**Io**

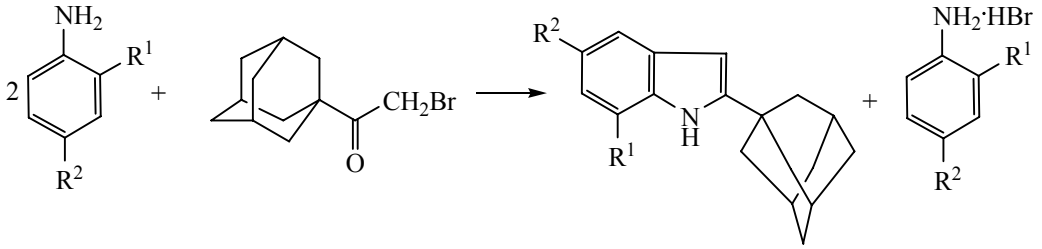
Comp. no.	Method	Yield, %	mp, °C (solvent)	Found, %			Formula	Calculated, %		
				C	H	N		C	H	N
Ia	*a*	41	115–116 (H_2O–MeOH), 114–115 [11]	80.84	5.74	6.13	$C_{15}H_{13}NO$	80.69	5.87	6.27
Ib	*a*	29	116–118 ($CHCl_3$)	74.80	4.90	5.77	$C_{15}H_{12}FNO$	74.67	5.01	5.81
Ic	*b*	51	Oily substance	42.19	2.64	3.20	$C_{15}H_{11}BrINO$	42.09	2.59	3.27
Id	*a*	37	197–198 (H_2O–MeOH)	84.19	7.54	3.83	$C_{25}H_{27}NO$	83.99	7.61	3.92
Ie	*b*	60	184–186 (cyclohexane)	69.01	5.96	3.15	$C_{25}H_{26}BrNO$	68.81	6.01	3.21
If	*b*	57	210–212 (cyclohexane)	74.80	6.42	6.88	$C_{25}H_{26}N_2O_3$	74.60	6.51	6.96
Ig	*b*	51	207–209 ($CHCl_3$)	84.29	7.78	3.83	$C_{26}H_{29}NO$	84.06	7.87	3.77
Ih	*b*	84	188–189 (cyclohexane)	84.09	7.56	3.85	$C_{25}H_{27}NO$	83.99	7.61	3.92
Ii	*b*	61	202–204 (MeOH)	81.12	7.13	3.70	$C_{26}H_{27}NO_2$	81.01	7.06	3.63
Ij	*b*	37	240–242 (MeOH)	83.92	7.95	3.81	$C_{26}H_{29}NO$	84.06	7.87	3.77
Ik	*b*	41	202–204 (MeOH)	83.93	7.95	3.81	$C_{26}H_{29}NO$	84.06	7.87	3.77
Il	*a*	39	70–72 (H_2O–MeOH), 95 [5]	81.15	6.28	5.82	$C_{16}H_{15}NO$	80.98	6.37	5.90
Im	*b*	48	125–127 ($CHCl_3$)	66.37	4.03	6.65	$C_{23}H_{17}BrN_2O$	66.20	4.11	6.71
In	*b*	34	151–153 (H_2O–MeOH), 151 [5]	68.17	4.90	9.77	$C_{16}H_{14}N_2O_3$	68.07	5.00	9.92
Io	*b*	42	162–164 (H_2O–MeOH)	68.29	4.90	9.79	$C_{16}H_{14}N_2O_3$	68.07	5.00	9.92

mantyl ketone and the corresponding anilines according to Bischler [22] (Scheme 2).

In both cases (i.e., in the reactions in melt and in solution) methylenequinone is generated thermally from hydroxybenzyl alcohol, and the subsequent Michael addition of indole molecule gives C-alkylation product at position *3* unless it is occupied (Scheme 3).

Intermediate formation of *o*- and *p*-methylenequinones rather than hydroxybenzyl carbocations follows from the fact that prolonged (for many hours) heating of indoles with *p*-methoxybenzyl alcohol both in DMF and under solvent-free conditions did not result in the formation of 4-methoxybenzyl-substituted indoles. Moreover, *m*-hydroxybenzyl alcohol failed to react with indoles with formation of 3-(1*H*-indolyl-methyl)phenols. No expected 5a,6,10b,11-tetrahyd-rochromeno[2,3-*b*]-indole derivatives were detected [5, 7, 10]. In addition, due to lower basicity and nucleo-philicity, indoles are less reactive than most azoles (imidazoles, benzimida-

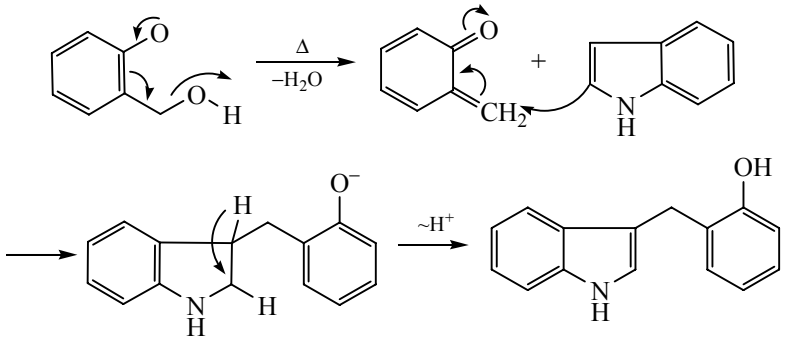
Scheme 2.



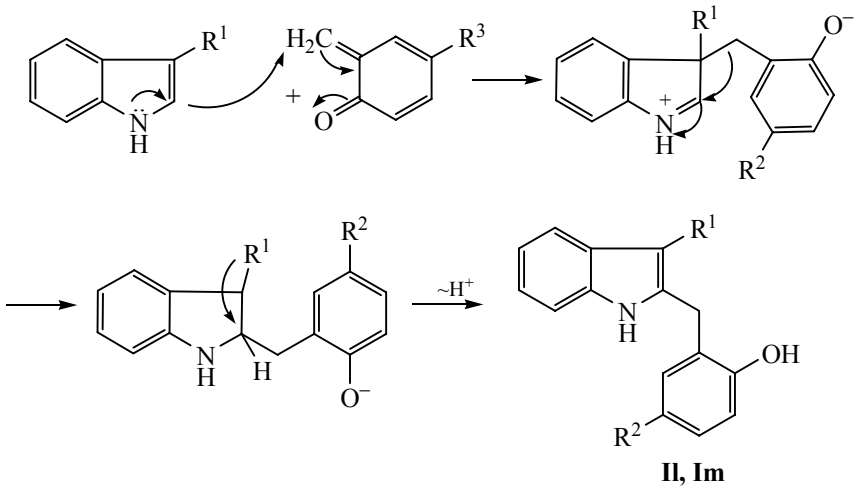
IIa–IId

II, $R^1 = R^2 = H$ (**a**), $R^1 = H$, $R^2 = CH_3$ (**b**), $R^1 = CH_3$, $R^2 = H$ (**c**), $R^1 = OCH_3$, $R^2 = H$ (**d**).

Scheme 3.



Scheme 4.



II, Im

I, $R^1 = CH_3$, $R^2 = H$ (**l**), R^1 = 1*H*-indol-3-yl, $R^2 = Br$ (**m**).

zoles, 1,2,4-triazoles, and benzotriazoles) toward methylenequinones [23].

We failed to react 5-iodo-1*H*-indole and 4,6-dimethoxy-1*H*-indole with *o*-hydroxybenzyl alcohol in the absence of a solvent. In the first case, 5-iodo-1*H*-indole above 120–130°C underwent vigorous decomposition with liberation of molecular iodine and formation of infusible products. In the second case, the main component of the reaction mixture was unreacted 4,6-dimethoxy-1*H*-indole. On the other hand, in the reaction of 5-iodo-1*H*-indole with 5-bromo-2-hydroxybenzyl alcohol in DMF we isolated the corresponding 4-bromo-2-(5-iodo-1*H*-indol-3-ylmethyl)-phenol (**Ic**). The reaction with 4,6-dimethoxy-1*H*-indole involved only gradual oxidation and decomposition of *o*-hydroxybenzyl alcohol, and unreacted 4,6-dimethoxyindole predominated in the reaction mixture. Likewise, only the initial indole was isolated from the reaction mixture obtained from sterically hindered 3-(tripphenylmethyl)-1*H*-indole and *o*-hydroxybenzyl alcohol.

The IR spectra of compounds **Ia**–**Ik** contained two absorption bands in the region 3100–3560 cm^{-1}, which were assigned to stretching vibrations of OH and NH bonds. Protons in the methylene group in **Ia**–**Ik** resonated in the ^1H NMR spectra in the region δ 4.00–4.29 ppm; had the alkylation occurred at the nitrogen atom, the corresponding signal would be observed at δ 5.3–5.6 ppm [24, 25]. Protons in the adamantane fragment of compounds **Id**–**Ik** resonated in the region δ 1.81–2.21 ppm, generally as three broadened singlets with an intensity ratio of 6 : 3 : 6.

The reactions with 3-substituted indoles (3-methyl-1*H*-indole and 3,3′-biindole) are likely to involve initially carbon atom in the 3-position with formation of 3,3-dialkyl-3*H*-indolium ion, followed by migration

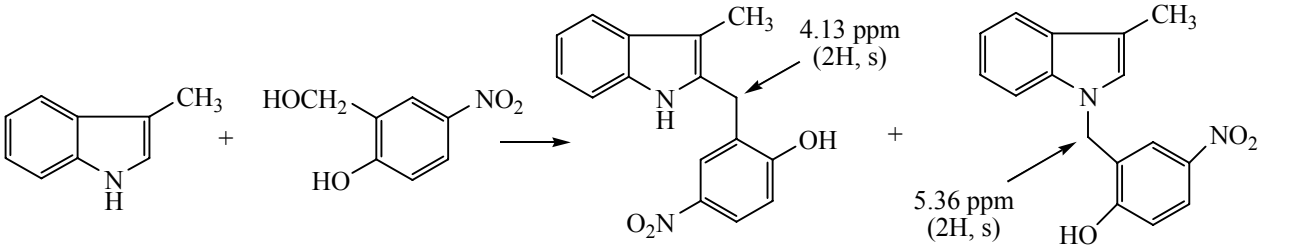
Table 2. ^{1}H NMR and IR spectra of 2- and 4-(1*H*-indolylmethyl)phenols

Comp. no.	IR spectrum, ν, cm^{-1}	^{1}H NMR spectrum, δ, ppm
Ia	3502, 3387 (NH/OH), 3051 (CH_{arom}), 2893, 2835 (CH_2), 1589 (C=C), 1501, 1454, 1431, 1335, 1261, 1219, 1188, 1169, 1095, 1049, 1007, 849, 760, 744, 613, 582, 501	4.08 s (2H, CH_2), 6.78–6.88 m (3H, H_{arom}), 7.02–7.17 m (5H, H_{arom}), 7.42 d (1H, 4'-H, *J* = 8.10 Hz), 7.55 d (1H, 7'-H, *J* = 8.10 Hz), 9.06 br. s (1H, NH)
Ib	3487, 3379 (NH/OH), 3040 (CH_{arom}), 2900 (CH_2), 1582 (C=C), 1501, 1454, 1366, 1331, 1261, 1227, 1167, 1095, 968, 824, 785, 766, 727, 579, 494, 447	4.07 s (2H, CH_2), 6.80 t (1H, 4-H, *J* = 7.47 Hz), 6.85–6.93 m (3H, H_{arom}), 6.99 t.d (1H, H_{arom}, *J* = 7.78, 4.98 Hz), 7.07–7.13 m (3H, H_{arom}), 7.36 d (1H, 4'-H, *J* = 7.78 Hz), 9.35 br.s (1H, NH)
Ic	3421, 3340 (OH/NH), 2924, 2854 (CH_2), 1585 (C=C), 1543, 1489, 1454, 1415, 1385, 1265, 1223, 1169, 1103, 872, 813, 794, 737, 625, 579	4.00 s (2H, CH_2), 6.81 d (1H, 6-H, *J* = 8.41 Hz), 7.09 d (1H, 2'-H, *J* = 2.18 Hz), 7.16 d (1H, 3-H, *J* = 2.49 Hz), 7.20 d.d (1H, 5-H, *J* = 8.41, 2.49 Hz), 7.27 d (1H, 7'-H, *J* = 8.41 Hz), 7.41 d.d (1H, 6'-H, *J* = 8.41, 1.56 Hz), 7.63 br.s (1H, OH), 7.90 d (1H, 4'-H, *J* = 0.94 Hz), 9.37 br. s (1H, NH)
Id	3553, 3402 (NH/OH), 3055, 3028 (CH_{arom}), 2908, 2851 (CH_{Ad}), 1582 (C=C), 1485, 1458, 1427, 1339, 1315, 1273, 1242, 1180, 1161, 1099, 1041, 752, 744, 702, 633	1.81 s (6H, CH_2, Ad), 2.06 br.s (3H, CH, Ad), 2.14 s (6H, CH_2, Ad), 4.26 s (2H, CH_2), 6.65–6.68 m (2H, H_{arom}, OH), 6.86–6.90 m (2H, H_{arom}), 6.94 t.d (1H, 5'-H, *J* = 8.10, 0.93 Hz), 7.01–7.05 m (1H, H_{arom}), 7.08 t. d (1H, 6'-H, *J* = 8.10, 0.93 Hz), 7.20 d (1H, 7'-H, *J* = 7.78 Hz), 7.39 d (1H, 4'- H, *J* = 8.10 Hz), 9.04 br.s (1H, NH)
Ie	3545, 3472, 3425, 3213 (NH/OH), 3047 (CH_{arom}), 2901, 2847 (CH_{Ad}), 1489, 1466, 1431, 1339, 1315, 1261, 1207, 1165, 1099, 1018, 806, 744, 609	1.82 s (6H, CH_2, Ad), 2.07 br.s (3H, CH, Ad), 2.13 s (6H, CH_2, Ad), 4.20 s (2H, CH_2), 6.69 d (1H, 3-H, *J* = 2.48 Hz), 6.82 d (1H, 6-H, *J* = 8.41 Hz), 6.96–6.99 m (1H, 6'-H), 7.11 t.d (1H, indole, *J* = 8.04, 1.24 Hz), 7.16 d.d (1H, 5-H, *J* = 8.41, 2.48 Hz), 7.20 s (1H, OH), 7.25 d (1H, 5'- H, *J* = 7.81 Hz), 7.42 d (1H, 4'-H, *J* = 8.41 Hz), 9.12 br.s (1H, NH)
If	3464 (NH/OH), 2912, 2847 (CH_{Ad}), 1589 (C=C), 1516 (NO_2), 1493, 1462, 1435, 1335 (NO_2), 1281, 1200, 1076, 829, 741	1.81 s (6H, CH_2, Ad), 2.05 br.s (3H, CH, Ad), 2.13 s (6H, CH_2, Ad), 4.29 s (2H, CH_2), 6.98 t.d (1H, 5'- H, *J* = 7.76, 0.94 Hz), 7.03 d (1H, 6-H, *J* = 8.7 Hz), 7.13 t.d (1H, 6'-H, *J* = 8.1, 0.94 Hz), 7.24 d (1H, 4'-H, *J* = 7.76 Hz), 7.44 d (1H, 7'-H, *J* = 8.1 Hz), 7.50 d (1H, 3-H, *J* = 2.8 Hz), 7.98 d.d (1H, 5-H, *J* = 8.7, 2.8 Hz), 8.65 br.s and 9.21 br.s (2H, OH, NH)
Ig	3517, 3398 (NH/OH), 2912, 2851 (CH_{Ad}), 1585 (C=C), 1485, 1458, 1317, 1198, 1184, 1165, 1040, 802, 752, 633	1.80 s (6H, CH_2, Ad), 2.05 br.s (3H, CH, Ad), 2.12 s (6H, CH_2, Ad), 2.33 s (3H, CH_3), 4.21 s (2H, CH_2), 6.64–6.69 m (2H, 4-H, OH), 6.86 d (1H, 6-H, *J* = 7.78 Hz), 6.91 d (2H, 6'-H, 7'-H, *J* = 8.09 Hz), 7.00 s (1H, 4'- H), 7.04 m (1H, 5-H), 7.27 d (1H, 3-H, *J* = 8.10 Hz), 8.94 br.s (1H, NH)
Ih	3491, 3383 (NH/OH), 3055, 3024 (CH_{arom}), 2908, 2847 (CH_{Ad}), 1612 (C=C), 1512, 1462, 1435, 1339, 1315, 1250, 1177, 1099, 1014, 825, 744, 698, 621	1.83 s (6H, CH_2, Ad), 2.08 br.s (3H, CH, Ad), 2.16 s (6H, CH_2, Ad), 4.26 s (2H, CH_2), 6.63 br.s (1H, OH), 6.70 d (2H, 2-H, 6-H, *J* = 8.72 Hz), 6.93 t (1H, 5'-H, *J* = 7.48 Hz), 6.99 d (2H, 3-H, 5-H, *J* = 8.72 Hz), 7.08 t (1H, 6'- H, *J* = 7.48 Hz), 7.24 d (1H, 4'-H, *J* = 8.10 Hz), 7.37 d (1H, 7'-H, *J* = 8.10 Hz), 9.01 br.s (1H, NH)
Ii	3364 (NH/OH), 2905, 2847 (CH_{Ad}), 1647 (CO), 1585 (C=C), 1485, 1458, 1439, 1369, 1339, 1312, 1277, 1242, 1207, 1146, 829, 771, 737, 687, 609	1.82 s (6H, CH_2, Ad), 2.05 br. s (3H, CH, Ad), 2.14 s (6H, CH_2, Ad), 4.22 s (2H, CH_2), 6.87 s (1H, 6-H), 7.20–7.38 m (4H, H_{arom}), 7.49 d (1H, H_{arom}, *J* = 6.55 Hz), 7.72 d (1H, H_{arom}, *J* = 6.61 Hz), 9.61 s (1H, CHO), 9.74 br.s (2H, NH, OH)
Ij	3518, 3421 (NH/OH), 3020 (CH_{arom}), 2901, 2847 (CH_{Ad}), 1616 (C=C), 1512, 1477, 1443, 1312, 1261, 1169, 1099, 984, 825, 806, 613	1.82 s (6H, CH_2, Ad), 2.07 br.s (3H, CH, Ad), 2.13 s (6H, CH_2, Ad), 2.34 s (3H, CH_3), 4.23 s (2H, CH_2), 6.64 br.s (1H, OH), 6.70 d (2H, 2-H, 6-H, *J* = 8.4 Hz), 6.90 d.d (1H, 6'-H, *J* = 8.10, 0.94 Hz), 6.98 d (2H, 3-H, 5-H, *J* = 8.40 Hz), 7.05 s (1H, 4'-H), 7.25 d (1H, 7'- H, *J* = 8.10 Hz), 8.89 br.s (1H, NH)
Ik	3491, 3236 (ON/NH), 3051 (CH_{arom}), 2908, 2851 (CH_{Ad}), 1612, 1600 (C=C), 1508, 1450, 1407, 1365, 1315, 1234, 1169, 1103, 1018, 910, 845, 814, 791, 756, 741, 598	1.84 s (6H, CH_2, Ad), 2.09 br.s (3H, CH, Ad), 2.21 s (6H, CH_2, Ad), 2.53 s (3H, CH_3), 4.26 s (2H, CH_2), 6.65 br.s (1H, OH), 6.70 d (2H, 2-H, 6-H, *J* = 8.71 Hz), 6.84–6.89 m (2H, 5'-H, 6'-H), 6.99 d (2H, 3-H, 5-H, *J* = 8.71 Hz), 7.11 d.d (1H, 4'-H, *J* = 6.70, 2.49 Hz), 8.56 br.s (1H, NH)

Table 2. (Contd.)

Comp. no.	IR spectrum, ν, cm^{-1}	^1H NMR spectrum, δ, ppm
Il	3514, 3429 (NH/OH), 3047 (CH_{arom}), 2959, 2920 (CH_3, CH_2), 1589 (C=C), 1501, 1454, 1435, 1331, 1308, 1261, 1242, 1207, 1161, 1122, 1111, 1088, 760, 748, 683, 501	2.33 s (3H, CH_3), 4.08 s (2H, CH_2), 6.85 t.d (1H, 4-H, *J* = 7.47, 0.93 Hz), 6.92 d.d (1H, 6-H, *J* = 8.10, 0.93 Hz), 7.03–7.15 m (5H, OH, 3-H, 5-H, 5'-H, 6'-H), 7.31 d.d (1H, 7'-H, *J* = 6.85, 1.24 Hz), 7.43 d.d (1H, 4'-H, *J* = 7.48, 0.94 Hz), 8.92 br.s (1H, NH)
Im	3402 (ON/NH), 3055 (CH_{arom}), 2924 (CH_2), 1582 (C=C), 1481, 1458, 1411, 1385, 1265, 1238, 1169, 1103, 1010, 818, 787, 744	4.13 s (2H, CH_2), 6.82 d (1H, 6-H, *J* = 8.41 Hz), 7.03 d (1H, H_{arom}, *J* = 2.49 Hz), 7.07–7.11 m (2H, H_{arom}), 7.16 t.d (1H, H_{arom}, *J* = 8.10, 1.25 Hz), 7.20–7.25 m (3H, H_{arom}), 7.35 d (1H, H_{arom}, *J* = 2.17 Hz), 7.41–7.47 m (3H, H_{arom}), 7.55 d (1H, H_{arom}, *J* = 8.41 Hz), 9.27 br.s (1H, NH), 9.43 br.s (1H, NH)
In	3384 (OH), 3280-2840 (NH), 1589 (C=C), 1520 (NO_2), 1493, 1462, 1427, 1377, 1335 (NO_2), 1288, 1231, 1080, 829, 744	2.31 s (3H, CH_3), 4.13 s (2H, CH_2), 7.02–7.13 m (3H), 7.31 d (1H, 6-H, *J* = 7.76 Hz), 7.51 d (1H, 5-H, *J* = 7.80 Hz), 7.92 d (1H, *J* = 2.80 Hz), 8.04 d.d (1H, *J* = 7.76, 2.80 Hz), 8.56 br.s (1H, OH), 8.98 br.s (1H, NH)
Io	3410 (OH), 3078, 3047 (CH_{arom}), 2920, 2854 (CH_3, CH_2), 1598 (C=C), 1524 (NO_2), 1497, 1466, 1331 (NO_2), 1285, 1273, 1200, 1076, 837, 741	2.36 s (3H, CH_3), 5.36 s (2H, CH_2), 7.06 d (1H, 6-H, *J* = 8.72 Hz), 7.12 t (1H, 6'-H, *J* = 7.78 Hz), 7.12 s (1H, 3-H), 7.19 t (1H, 5'- H, *J* = 8.08 Hz), 7.35 d (1H, 4'-H, *J* = 8.08 Hz), 7.52 d (1H, 2'-H, *J* = 2.50 Hz), 7.61 d (1H, 7'-H, *J* = 7.78 Hz), 8.05 d.d (1H, 5-H, *J* = 8.72, 2.50 Hz), 8.52 br.s (1H, OH)

Scheme 5.



In **Io**

of the substituent to the 2-position (Plancher rearrangement) [26] (Scheme 4). In the reaction of 3-methyl-1*H*-indole with 2-hydroxy-5-nitrobenzyl alcohol, apart from the alkylation product at C^2 (compound **In**), we isolated the corresponding N-substituted derivative **Io**.

The IR and ^1H NMR spectra of compounds **Ia**–**Io** are given in Table 2.

EXPERIMENTAL

The IR spectra were recorded in KBr on a Shimadzu FTIR-8400S spectrometer. The ^1H NMR spectra were measured on a Bruker AM-400 spectrometer (400 MHz) from solutions in DMSO-d_6 using tetramethylsilane as internal reference. The elemental compositions were determined on an Euro Vector EA-3000 automatic CHNS-analyzer. Thin-layer chromatography was performed on Silufol UV-254/366 and Merck Kiesegel 60 F_{254} plates; spots were visualized under UV light or by treatment with iodine vapor. Silica gel AMSORB Si-10 (40–100 μm) was used for column chromatography. The melting points were determined in capillaries on a PTP-M melting point apparatus.

2-(1-Adamantyl)-1*H*-indoles IIa–IId (*general procedure*). A mixture of 12.5 g (49 mmol) of 1-adamantyl bromomethyl ketone and 50 g of the corresponding substituted aniline was heated for 1.5 h at the boiling point in an argon atmosphere. The mixture was cooled, 150 ml of chloroform was added, the mixture was washed with 2% hydrochloric acid (4×500 ml), aqueous solution of $NaHCO_3$, and two portions of water. The extract was dried over sodium sulfate, the solvent was distilled off under reduced pressure, and the residue was washed with a small amount of cold methanol and recrystallized from methanol. Compounds **IIa**–**IId** were isolated as colorless or light beige (**IId**) crystals.

2-(1-Adamantyl)-1*H*-indole (IIa) was synthesized from aniline. Yield 91%, mp 148–149°C; published data [22]: mp 149°C.

2-(1-Adamantyl)-5-methyl-1*H*-indole (IIb) was synthesized from *p*-toluidine. Yield 85%, mp 146–147°C. IR spectrum, ν, cm^{-1}: 3425 (N–H), 3020 (C–H_{arom}), 2912, 2847 (C–H_{Ad}), 1582 (C=C), 1535, 1477, 1450, 1408, 1342, 1312, 1288, 1234, 1184, 1103, 876, 872, 798, 771, 679, 598, 490. Found, %: C 85.71; H 8.80; N 5.31. $C_{19}H_{23}N$. Calculated, %: C 85.99; H 8.74; N 5.28.

2-(1-Adamantyl)-7-methyl-1*H*-indole (IIc) was synthesized from *o*-toluidine. Yield 89%, mp 194–195°C. IR spectrum, ν, cm^{-1}: 3448 (N–H), 3051 (C–H_{arom}), 2908, 2847 (C–H_{Ad}), 1543 (C=C), 1450, 1427, 1530, 1312, 1288, 1103, 787, 744, 683. Found, %: C 85.87; H 8.69; N 5.33. $C_{19}H_{23}N$. Calculated, %: C 85.99; H 8.74; N 5.28.

2-(1-Adamantyl)-7-methoxy-1*H*-indole (IId) was synthesized from *o*-anisidine. Yield 39%, mp 149–151°C. IR spectrum, ν, cm^{-1}: 3379, 3321 (N–H), 3051 (C–H_{arom}), 2901, 2847 (C–H_{Ad}), 1624, 1582 (C=C), 1543, 1501, 1447, 1404, 1331, 1319, 1246, 1084, 1049, 964, 795, 725, 710. Found, %: C 81.19; H 8.18; N 5.08. $C_{19}H_{23}NO$. Calculated, %: C 81.10; H 8.24; N 4.98.

2- and 4-(1*H*-Indolylmethyl)phenols Ia–Io *(general procedures). a*. An equimolar mixture of the corresponding indole and hydroxybenzyl alcohol was heated for 20 min at 160–165°C under vigorous stirring in an argon atmosphere (under solvent-free conditions) until water no longer separated. The mixture was cooled, thoroughly ground, and dissolved on heating in a minimal amount of carbon tetrachloride. The solution was applied to a column charged with silica gel, and the column was eluted first with carbon tetrachloride (until initial indole was washed off completely) and then with chloroform. The eluate was evaporated under reduced pressure, and the residue was recrystallized from appropriate solvent.

b. An equimolar mixture of the corresponding reactants was heated for 6 h in boiling DMF under argon. The mixture was cooled and poured into water, and the precipitate was filtered off or extracted into diethyl ether. The product was purified by column chromatography and recrystallized.

Following the above procedures, we synthesized 2-(1*H*-indol-3-ylmethyl)phenol (**Ia**), 2-(7-fluoro-1*H*-indol-3-ylmethyl)phenol (**Ib**), 4-bromo-2-(5-iodo-1*H*-indol-3-ylmethyl)phenol (**Ic**), 2-[2-(1-adamantyl)-1*H*-indol-3-ylmethyl]phenol (**Id**), 2-[2-(1-adamantyl)-1*H*-indol-3-ylmethyl]-4-bromophenol (**Ie**), 2-[2-(1-adamantyl)-1*H*-indol-3-ylmethyl]-4-nitrophenol (**If**), 2-[2-(1-adamantyl)-5-methyl-1*H*-indol-3-ylmethyl]phenol (**Ig**), 4-[2-(1-adamantyl)-1*H*-indol-3-ylmethyl]phenol (**Ih**), 5-[2-(1-adamantyl)-1*H*-indol-3-ylmethyl]-2-hydroxybenzal-dehyde (**Ii**), 4-[2-(1-adamantyl)-5-methyl-1*H*-indol-3-ylmethyl]phenol (**Ij**), 4-[2-(1-adamantyl)-7-methyl-1*H*-indol-3-ylmethyl]phenol (**Ik**), 2-(3-methyl-1*H*-indol-2-ylmethyl)phenol (**Il**), 4-bromo-2-[3-(1*H*-indol-3-yl)-1*H*-indol-2-ylmethyl]phenol (**Im**), 2-(3-methyl-1*H*-indol-2-ylmethyl)-4-nitrophenol (**In**), and 2-(3-methyl-1*H*-indol-1-ylmethyl)-4-nitrophenol (**Io**).

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