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A new synthesis of substituted 2-trifluoromethylindoles

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Characteristics for compounds **3b–l** .

*1-Hexyl-5-methoxy-2-(trifluoromethyl)-1*H-*indole* **3b**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 0.96 (s, 3H, Hex, H-6, ^{3}J 6.8 Hz); 1.34-1.40 м. (4H, Hex, H-4,5); 1.42-1.46 м. (2H, Hex, H-3); 1.82-1.89 м. (2H, Hex, H-2); 3.90 (s, 3H, OCH_3); 4.22 (t, 2H, Hex, H-1, ^{3}J 8.0 Hz); 6.88 (s, 1H, H-3); 7.06 (d, 1H, H-6, ^{3}J 8.8 Hz); 7.13 (s, 1H, H-4); 7.31 (d, 1H, H-7, ^{3}J 9.1 Hz). ^{13}C NMR ($CDCl_3$) δ: 13,98, 22.57, 26.64, 30.12, 31.42, 45.16 (C_{hexyl}); 55.72 ($O\underline{C}H_3$); 102.86 ($C_{arom.}$); 103,84 (q, ^{1}J 3.7 Hz, $\underline{C}$=C-CF_3); 111.20, 115.43 ($C_{arom.}$); 121.63 (q, ^{1}J 268.1 Hz, CF_3); 126.19 ($C_{arom.}$); 126.98 (q, ^{2}J 37.3 Hz, $\underline{C}$-CF_3); 133.1, 154.71 ($C_{arom.}$). Found (%): C, 63.98; H, 6.72; Calc. for $C_{16}H_{20}F_3NO$ (%): C, 64.20; H, 6.73.

*1-(2-Phenylethyl)-2-(trifluoromethyl)-1*H-*indole* **3c**: colourless crystals, mp 78-80 °C. ^{1}H NMR ($CDCl_3$) δ: 3.21 (t, 2H, Et, H-2, ^{3}J 8.2 Hz); 4.55 (t, 2H, Et, H-1, ^{3}J 8.2 Hz); 7.11 (s, 1H, H-3); 7.33-7.49 м. (8H, H-5,6,7, Ph, H-2-6); 7.81 (d, 1H, H-4, ^{3}J 8.1 Hz). ^{13}C NMR ($CDCl_3$) δ: 36.59, 46.63 (C_{alkyl}); 104.98 (q, ^{3}J 3.7 Hz, $\underline{C}$=C-CF_3); 110.25, 120.91 ($C_{arom.}$); 121.82 (q, ^{1}J 268.1 Hz, CF_3); 122.56, 124.63, 125.82, 126.03 ($C_{arom.}$); 126.69 (q, ^{2}J 37.3 Hz, $\underline{C}$-CF_3); 127.00, 128.89, 128.91, 137.86, 138.04, 138.25 ($C_{arom.}$). Found (%): C, 70.51; H, 4.88; Calc. for $C_{17}H_{14}F_3N$ (%): C, 70.58; H, 4.88.

*1-(2-Methoxyethyl)-2-(trifluoromethyl)-1*H-*indole* **3d**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 3.39 (s, 3H, OCH_3); 3.78 (t, 2H, 2-MeOEt, H-2, ^{3}J 6.2 Hz); 4.49 (t, 2H, 2-MeOEt, H-1, ^{3}J 6.3 Hz); 7.03 (s, 1H, H-3); 7.26 (t, 1H, H-6, ^{3}J 7.5 Hz); 7.43 (t, 1H, H-5, ^{3}J 7.7 Hz); 7.56 (d, 1H, H-7, ^{3}J 8.6 Hz); 7.72 (d, 1H, H-4, ^{3}J 7.8 Hz). ^{13}C NMR ($CDCl_3$) δ: 44.50, 59.11, 71.40 (C_{alkyl}); 105.10 (q, ^{3}J 3.7 Hz, $\underline{C}$=C-CF_3); 110.88, 120.89 ($C_{arom.}$); 121.64 (q, ^{1}J 268.1 Hz, CF_3); 122.20, 124.56, 125.76 ($C_{arom.}$); 126.74 (q, ^{2}J 37.3 Hz, $\underline{C}$-CF_3); 138.63 ($C_{arom.}$). Found (%): C, 59.02; H, 5.11; Calc. for $C_{12}H_{12}F_3NO$ (%): C, 59.26; H, 4.97.

*1-(3-Methoxypropyl)-2-(trifluoromethyl)-1*H-*indole* **3e**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 2.15 м. (2H, 3-MeOPr, H-2); 3.43 (s, 3H, OCH_3); 3.46 (t, 2H, 3-MeOPr, H-3, ^{3}J 5.8 Hz); 4.44 (d, 2H, 3-MeOPr, H-1, ^{3}J 7.3 Hz); 7.02 (s, 1H, H-3); 7.26 (t, 1H, H-6, ^{3}J 7.6 Hz); 7.43 (t, 1H, H-5, ^{3}J

7.6 Hz); 7.54 (d, 1H, H-7, ^{3}J 8.6 Hz); 7.73 (d, 1H, H-4, ^{3}J 8.1 Hz). ^{13}C NMR ($CDCl_3$) δ: 30.44, 41.94, 58.63, 69.45 (C_{alkyl}); 104.82 (q, ^{3}J 3.7 Hz, C=C-CF_3); 110.42, 120.74 ($C_{arom.}$); 121.71 (q, ^{1}J 268.1 Hz, CF_3); 122.27, 124.47, 125.77 ($C_{arom.}$); 126.74 (q, ^{2}J 37.3 Hz, C-CF_3); 138.22 ($C_{arom.}$). Found (%): C, 60.41; H, 5.45; Calc. for $C_{13}H_{14}F_3NO$ (%): C, 60.70; H, 5.49.

*1-[2-(3,4-Diethoxyphenyl)ethyl]-2-(trifluoromethyl)-1*H-*indole* **3f**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 1.49-1.55 м. (6H, OEt, H2); 3.08 (t, 2H, Et, H-2, ^{3}J 6.1 Hz); 4.06-4.17 м. (4H, OEt, H-1); 4.47 (t, 2H, Et, H-1, ^{3}J 6.3 Hz); 6.73 (s, 1H, H-3); 6.80 (d, 1H, Ph, H-5, ^{3}J 7.8 Hz); 6.88 (dd, 1H, Ph, H-6, ^{3}J 8.1 Hz, ^{3}J 2.8 Hz); 7.04 (s, 1H, Ph, H-2); 7.24-7.27 м. (1H, H-7); 7.39 (s, 2H, H-5,6); 7.74 (d, 1H, H-4, ^{3}J =7.6 Hz). ^{13}C NMR ($CDCl_3$) δ: 14.93, 36.10, 46.75, 64.73 (C_{alkyl}); 104.89 (q, ^{3}J 3.7 Hz, C=C-CF_3); 110.32, 114.06, 114.54, 120.81, 121.10 ($C_{arom.}$); 121.78 (q, ^{1}J 268.4 Hz, CF_3); 122.41, 124.53, 125.88 ($C_{arom.}$); 126.57 (q, ^{2}J 36.9 Hz, C-CF_3); 130.72, 137.89, 147.88, 149.07 ($C_{arom.}$). Found (%): C, 65.60; H, 5.64; Calc. for $C_{21}H_{22}F_3NO_2 \times 1/2\ H_2O$ (%): C, 65.27; H, 6.00.

*1-Isopropyl-2-(trifluoromethyl)-1*H-*indole* **3g**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 1.74 (d, 6H, CH_3, ^{3}J 7.1 Hz); 4.84-4.91 м. (1H, CH); 6.96 (s, 1H, H-3); 7.23 (t, 1H, H-5, ^{3}J 7.2 Hz); 7.36 (t, 1H, H-6, ^{3}J 7.2 Hz); 7.67 (d, 1H, H-7, ^{3}J 8.3 Hz); 7.74 (d, 1H, H-4, ^{3}J 8.1 Hz). ^{13}C NMR ($CDCl_3$) δ: 21.32, 49.37 ($C_{alkyl.}$); 104.35 (q, ^{3}J 4.4 Hz, C=C-CF_3); 113.04, 120.30 ($C_{arom.}$); 121.75 (q, ^{1}J 267.9 Hz); 122.72, 123.79, 126.57 (q, ^{2}J 36.9 Hz, C-CF_3), 127.29, 132.04, 132.91 ($C_{arom.}$). Found (%): C, 59.99; H, 5.16; Calc. for $C_{12}H_{12}F_3N \times 2/3\ H_2O$ (%): C, 60.25; H, 5.62.

*1-Ethyl-2-(trifluoromethyl)-1*H-*indole* **3h**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 1.51 (t, 3H, CH_3, ^{3}J 7.1 Hz); 4.39 (q, 2H, CH_2, ^{3}J 7.1 Hz); 7.02 (s, 1H, H-3); 7.28 (t, 1H, $H_{arom.}$, ^{3}J 6.7 Hz); 7.40-7.51 м. (2H, $H_{arom.}$); 7.77 (d, 1H, H-4, ^{3}J 7.8 Hz).^{13}C NMR ($CDCl_3$) δ: 15.11, 39.65 (C_{alkyl}); 104.43 (q, ^{3}J 3.7 Hz, C=C-CF_3); 110.11, 120.70 ($C_{arom.}$); 121.73 (q, ^{1}J 267.9 Hz, CF_3); 122.45, 124.40, 126.04 ($C_{arom.}$); 126.63 (q, ^{2}J 37.3 Hz, C-CF_3); 127.30 ($C_{arom.}$). Found (%): C, 58.96; H, 5.12; Calc. for $C_{11}H_{10}F_3N \times 2/3\ H_2O$ (%): C, 58.66; H, 5.07.

*1-Ethyl-5-methoxy-2-(trifluoromethyl)-1*H-*indole* **3i**: colourless crystals, mp 53-55 °C. ^{1}H NMR ($CDCl_3$) δ: 1.47 (t, 3H, Et, H-2, ^{3}J 7.2 Hz); 3.92 (s, 3H, OCH_3); 4.30 (q, 2H, Et, H-1, ^{3}J 7.1 Hz); 6.91 (s, 1H, H-3); 7.10 (d, 1H, H-6, ^{3}J 8.8 Hz); 7.16 (s, 1H, H-4); 7.33 (d, 1H, H-7, ^{3}J 8.8 Hz). ^{13}C NMR ($CDCl_3$) δ: 15.18, 39.70, 55.70 (C_{alkyl}); 103.01 ($C_{arom.}$); 103.84 (q, ^{3}J 3.7 Hz, C=C-CF_3); 110.95, 115.49 ($C_{arom.}$); 121.6 (q, ^{1}J 268.1, CF_3); 126.34, 126.63 (q, ^{2}J 37.3 Hz, C-CF_3), 132.76, 133.97, 154.80 ($C_{arom.}$). Found (%): C, 59.07; H, 5.01; Calc. for $C_{12}H_{12}F_3NO$ (%): C, 59.26; H, 4.97.

*5-Ethoxy-1-ethyl-2-(trifluoromethyl)-1*H-*indole* **3j**: colourless crystals, mp 68-70 °C. ^{1}H NMR ($CDCl_3$) δ: 1.46 (t, 3H, Et, H-2, ^{3}J 7.2 Hz); 1.51 (t, 3H, OEt, H-2, ^{3}J 7.0 Hz); 4.08 (q, 2H, Et, H-1, ^{3}J 7.1 Hz); 4.29 (q, 2H, OEt, H-1, ^{3}J 7.1 Hz); 6.88 (s, 1H, H-3); 7.08 (d, 1H, H-6, ^{3}J 8.9

Hz); 7.14 (s, 1H, H-4); 7.31 (d, 1H, H-7, ^{3}J 8.9 Hz). ^{13}C NMR ($CDCl_3$) δ: 14.94, 15.19, 39.69, 64.08 (C_{alkyl}); 103.80 (q, ^{3}J 4.0 Hz, C=C-CF_3); 104.08, 110.88, 115.97 ($C_{arom.}$); 121.65 (q, ^{1}J 268.1 Hz, CF_3); 126.33, 126.63 (q, ^{2}J 37.3 Hz, C-CF_3), 130.24, 133.61, 154.02 ($C_{arom.}$). Found (%): C, 59.46; H, 5.32; Calc. for $C_{13}H_{14}F_3NO \times 1/3\ H_2O$ (%): C, 59.31; H, 5.62.

*1-Ethyl-5,6,7-trimethoxy-2-(trifluoromethyl)-1*H-*indole* **3k**: colourless crystals. ^{1}H NMR ($CDCl_3$) δ: 1.44 (t, 3H, CH_3, ^{3}J 7.1 Hz); 3.93 (s, 3H, 6-OMe); 3.96 (s, 3H, 5-OMe); 4.11 (s, 3H, 7-OMe); 4.45 (q, 2H, CH_2, ^{3}J 7.1 Hz); 6.81 (s, 1H, H-3); 6.85 (s, 1H, H-4). ^{13}C NMR ($CDCl_3$) δ: 16.65, 41.63, 56.11, 61.14, 61.58 (C_{alkyl}); 97.95 ($C_{arom.}$); 104.64 (q, ^{3}J 4.0 Hz, C=C-CF_3); 121.55 (q, ^{1}J 267.9 Hz, CF_3); 122.67, 125.47 ($C_{arom.}$); 126.90 (q, ^{2}J 37.0 Hz, C-CF_3); 140.73, 140.81, 149.78 ($C_{arom.}$). Found (%): C, 55.59; H, 5.42; Calc. for $C_{14}H_{16}F_3NO_3$ (%): C, 55.44; H, 5.32.

*1-[2-(3,4-Dimethoxyphenyl)ethyl]-2-(trifluoromethyl)-1*H-*indole* **3l**: yellowish oil. ^{1}H NMR ($CDCl_3$) δ: 3.07 (t, 2H, Et, H-2, ^{3}J 7.8 Hz); 3.84 с. (1H, OMe); 3.90 с. (1H, OMe); 4.46 (t, 2H, Et, H-1, ^{3}J 7.8 Hz); 6.64 (s, 1H, $H_{arom.}$); 6.78-6.87 м. (2H, $H_{arom.}$); 7.02 (s, 1H, $H_{arom.}$); 7.24 (t, 1H, $H_{arom.}$, ^{3}J 7.0 Hz); 7.33-7.42 м. (2H, $H_{arom.}$); 7.73 (d, 1H, H-4, ^{3}J 7.8 Hz). ^{13}C NMR ($CDCl_3$) δ: 36.05, 46.67, 55.77, 55.91 (C_{alkyl}); 104.91 (q, ^{3}J 3.7 Hz, C=C-CF_3); 110.31, 111.60, 112.13, 120.81 ($C_{arom.}$); 121.78 (q, ^{1}J 268.4 Hz, CF_3); 122.38, 124.51, 125.85, 125.97 ($C_{arom.}$); 126.52 (q, ^{2}J 37.3 Hz, C-CF_3); 130.56, 137.88, 148.12, 149.19. Found (%): C, 65.17; H, 5.16; Calc. for $C_{19}H_{18}F_3NO_2$ (%): C, 65.32; H, 5.19.