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Organic Chemistry

Synthesis of O-and N-Methyl Derivatives of 5(6)-Hydroxy-4(7)-nitro-2-(1-adamantyl)benzimidazole

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ABSTRACT: 5(6)-Alkoxy-4-nitro-2-(1-adamantyl)benzimidazole derivatives were synthesized where alk=Me, Bn. The O- and N- alkylation reaction of 5(6)-hydroxy-4(7)-nitro-2-(1-adamantyl)benzimidazole with methyl iodide in the presence of NaH or K_2CO_3 was studied. Their structures were decisively elucidated by spectroscopic analysis including 1D and 2D NMR techniques. The formation of benzimdiazole ring has been performed via four synthetic steps starting with coupling of 1-adamantane carboxylic acid chloride with 3-aminophenole and further nitration, reduction and acid-catalyzed cyclization of the obtained amide. *© 2018 Bull. Georg. Natl. Acad. Sci.*

Key words: benzimidazole, adamantane, alkylation reaction, organic synthesis

Benzimidazole is an important pharmacophore which is distinguished with a broad spectrum of bioactivity and medicines made of its base are successfully used in agriculture, veterinary and clinical medicine. Biochemical and pharmacological tests have shown that this remarkably effective biologically active molecule act efficiently against numerous microorganisms [1,2]. The benzimidazole motif occurs in many approved and investigational drugs and its derivatives possess varied pharmacological activities such as anti-ulcer, anti-psychotic, anthelmintic, antifungal, anti-protozoal, anti-tubercular and cancer, anti-inflammatory, antidiabetic, anti-microbial, antioxidant, etc [3-10] and research in direction of the synthesis of its novel derivatives with improved biological activities is intensively progressing.

It is well known that beside the versatile biological activity of adamantane derivatives [11-12], the exceptional structural and chemical properties of adamantane are successfully used in the field of targeted drug delivery system and in the study of cell recognition [13]. Many experiments revealed that inputting of bulk high lipophilic adamantane moiety into the molecule increases its lipophilicity and improves pharmacokinetics via interaction of lipophilic adamantane with lipid layer of the cell and therefore enhance permeability of biological membrane [14].

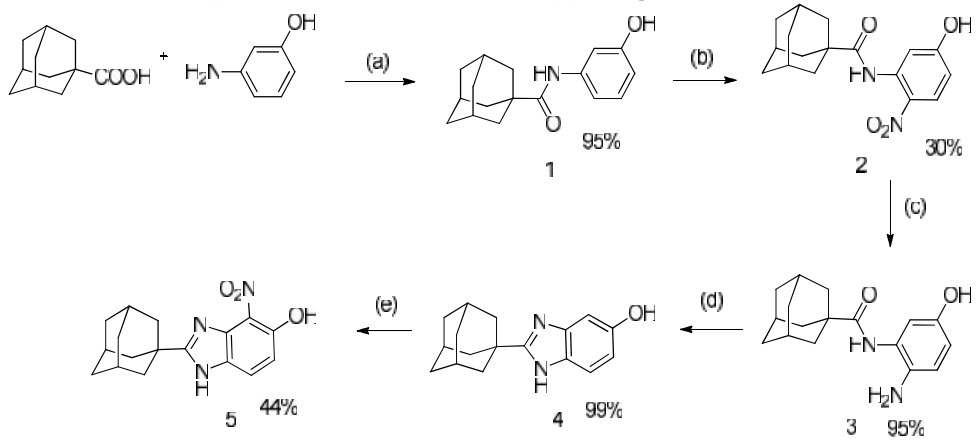
In direction of searching the new biological active molecules with improved pharmacological charactristics, the purpose of presented work was the synthesis of adamantane-bonded some benzimidazole derivatives – 2-(1-adamantyl)

benzimidazole with nitro group at position 4 and hydroxyl, methoxy and benziloxy radicals at position 5(6) in benzimidazole aromatic ring.

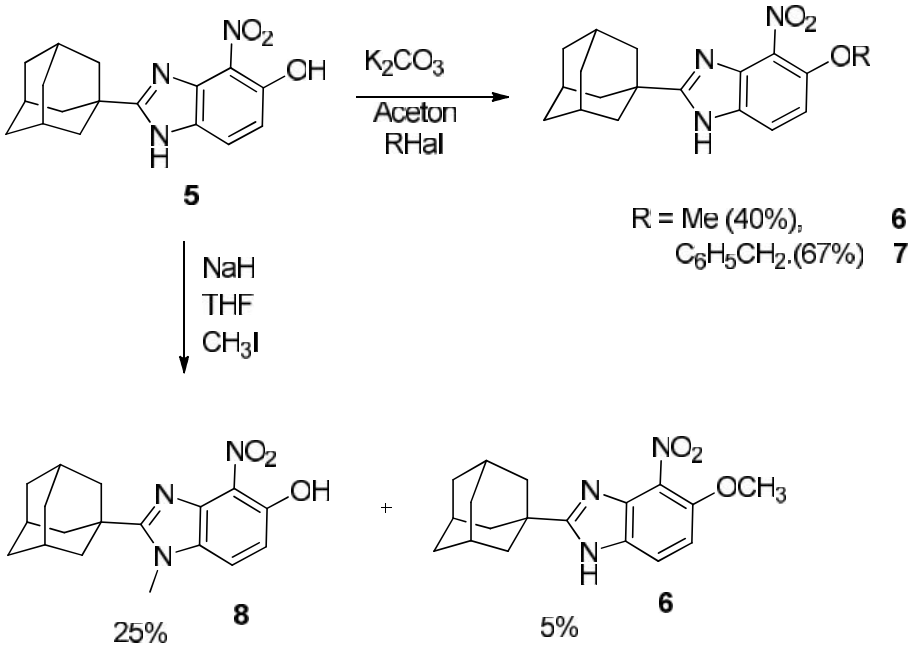
Our procedure to synthesize the benzimidazole 4 and 5 started with the conversion of 1-adamantane carboxylic acid to the corresponding acid chloride and the reaction of this intermediate product with 3-aminophenole under Schotten-Baumann conditions leading to the production of amide **1** in 95% yield**.** Nitration reaction of the obtained amide **1** with 65 % nitric acid in acetic acid gave three regioisomers, which can be separated from the desired nitro product **2** (30%) by recrystallization from ethanol. After reduction of nitro group by molecular H_2 on Pt-Fe/C catalyst in EtOH at room temperature, the corresponding aminoamide **3** (95 %) was isolated. The subsequent acid-catalyzed cyclization of compound **3** using trifluoroacetic acid in toluene gave the desired 5-Hydroxy-2-(1-adamantyl) benzimidazole **4** in 99% yield. The further nitration of benzimidazole substituted with a strong electron-donating hydroxy group at position 5 outweighed the inherent greater reactivity of position 6 and afforded mainly the 4-nitro [15] derivative **5** in 44% yield. The synthetic pathway for preparation of benzimidazole **5** is shown in **Scheme 1**. The detailed characterization and spectroscopic data of regioisomers of nitro products **2** and **5** is reported in our previously published work [16].

Our further attempt was investigation of alkylation reaction of synthesized 4(7)-Nitro-5(6)-hydroxy-2-(1-adamantyl)benzimidazole **5** (**scheme 2**). It was found that in the case of using NaH as a base during methylation reaction by methyl iodide in THF, O-methyl (compound **6,** 5%), as well as N-methyl (compound **8,** 25%) derivatives were formed. Interestingly, when NaH was replaced with potassium carbonate in acetone, only O-methylation product **6** (40%) was isolated. Similarly, alkylation with benzyl bromide gave only O-alkylation product **7** (67%) in the presence of potassium carbonate. The O- and N- alkylation products were established unambiguously by HMBC (Heteronuclear Multiple Bond Correlation) and HMQC (Heteronuclear Multiple Quantum Coherence) experiments (Table 1). In 1-methyl-4-nitro-5-hydroxy-2-(1-adamantyl)benzimidazole (8) the long-range correlations were observed between N-CH_3 (s, 3.98) and two carbons C-2 and 7a, and unsubstituted O-H was correlated with three aromatic carbons C-4, 5 and 6. While in compound **6** the long range correlation is occurred between O-CH_3 and aromatic carbon C-5. O-substitution in compound **7** can be confirmed by visible long range

Scheme 1. The synthesys pathway of 4-Nitro-5-hydroxy-2-(1-adamantyl)-1H-benzimidazole. (a) 1) $SOCl_2$, 55-60°C, 1 h; 2) $NaHCO_3$, CH_2Cl_2, 23°C, 4 h. (b) 1.4 equiv. HNO_3, AcOH, 23°C, 1 h; (c) Pt,Fe/C (cat.), 1 atm H_2, EtOH, 23°C, 24 h; (d) CF_3COOH, toluene, 110°C, 6 h; (b) 1.5 equiv. HNO_3, AcOH, 23°C, 30 min



Scheme 2. The alkylation reaction of 4-Nitro-5-hydroxy-2-(1-adamantyl)benzimidazole.



correlation between H-18 and C-5 as well as correlation of unsabstituted N-H with C-2, 7a and 7.

In conclusion, new O- and N- alkyl derivatives of 5(6)-hydroxy-4-nitro-2-(1-adamantyl)benzimidazole were synthesized and characterized by IR, ^{1}H-NMR, ^{13}C-NMR, HMQC, HMBC, HR-Mass spectral and elemental analysis. We have reported four steps synthesis method for 5(6)-hydroxy-2-(1-adamantyl)benzimidazole ring and studied its methylation reaction in the presence of two dif ferent base and solvent.

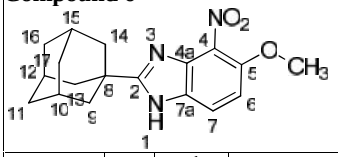
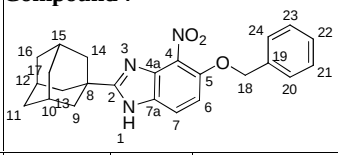
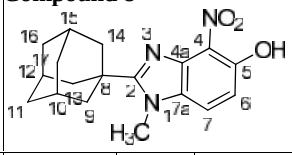
Experimental Part

TLC was performed on Merck aluminium plates coated with SiO_2 F_{254}. Preparative column chromatography was carried out using Merck SiO_2 (35–70 µm, type 60 Å) with n-hexane and EtOAc as eluents. ^{1}H (500 MHz), ^{13}C-NMR (125 MHz), HMBC and HMQC NMR spectra were recorded on Bruker Avance DRX 500 instruments. Multiplicities of carbon signals were determined with DEPT experiments. MS and HRMS spectra were obtained with a Finnigan MAT95 (EI) and a Waters Q-TOF Premier (ESI, all in positive mode) spectrometer. IR spectra were recorded on a Bruker Tensor 27 spectrometer equipped with a "Golden Gate" diamond ATR unit. Elemental analyses were measured with a Euro EA-CHNS instrument from HEKAtech. Melting points of crystalline compounds were determined on a Gallenkamp Melting Point Apparatus and are uncorrected.

Reagents and starting materials were purchased from common commercial suppliers and used without further purification. Solvents were purified and dried following standard procedure.

N-(3-Hydroxyphenyl)adamantane-1-carboxamide (1). 1-Adamantanecarboxylic acid (1.09 g, 6.00 mmol, 1 eq) was dissolved in 3 mL of $SOCl_2$ and the mixture was refluxed for 1 h. The $SOCl_2$ was removed *in vacuo*. The crude acid chloride was dissolved in 10 mL CH_2Cl_2 and then added dropwise into a solution of 3-hydroxyaniline (0.65 g, 6.00 mmol, 1 eq) and 3 mL triethylamine in 20 mL CH_2Cl_2 and 10 mL $NaHCO_3$ (2 M). The reaction mixture was stirred for 4 hours at room temperature. Afterwards, it was diluted with hydrochloric acid (1 mol / L) and water. The white residue was filtered and washed with water and dried to give the title compound **1** (1.55 g, 5.70 mmol, 95%) as colorless crystals. M.p.: 187-

Table 1. ^{1}H, ^{13}C-NMR and HMBC NMR data for compounds 6, 7 and 8.

Compound 6 				**Compound 7** 			**Compound 8** 		
N	1H[a]	13C[b]	HMBC (H→C)	1H[a]	13C[b]	HMBC (H→C)	1H[a]	13C[b]	HMBC (H→C)
CH_3	4.03	57.51	C-5				3.98 (s)	32.84	C-2, 7a
OH							11.26 (s)		C-4,5,6
1	10.14 (s)			10.17 (s)		C-2, 7a, 7			
2		163.42			163.53			163.83	
3									
4		130.52			130.35			125.15	
4a		123.77			124.12			136. 80	
5		152.84			151.60			153.76	
6	6.95 (d)	107.65	C-5, 6, 7, 7a	6.92 (d)	109.5	C-4, 5, 7, 7a	7.00 (d)	113.22	C-4, 5, 7, 7a
7	7.91 (d)	127.15	C-4, 5, 7	7.78 (d)	128.24	C-4a, 5, 6, 7a,	7.49	118.09	C-4,5,4a,7a
7a		138.81			138.86			132.28	
8		29.40			35.54			37.01	
9,13,14	2.02 – 2.12 (m)	41.34	C-2,8, 10, 11, 12, 15, 16, 17	1.97-2.10 (m)	41.24	C-2,8, 10, 11, 12, 15, 16, 17	2.18 – 2.27 (m)	40.10	C-2, 8, 10, 11, 12, 15, 16, 17
10,12,15	2.02 – 2.12 (m)	28.25	C-9, 13, 14, 11, 16, 17	1.97-2.10 (m)	28.15	C-9, 13, 14, 11, 16, 17	2.0 – 2.15 (m)	28.40	C-9, 13, 14, 11, 16, 17
11,16,17	1.71 – 1.82 (m)	36.53	C-8,9,10,12,13,14, 15	1.62-1.80 (m)	36.45	C-8,9,10,12, 13,14,15	1.69 – 1.84 (m)	36.62	C-8,9,10,12,13,14, 15
18				5.22 (s)	72.25	C-5, 19,20,24			
19					135.86				
20,24				7.44 (d)	128.74	C-18,19, 21,23			
21,23				7.30 (t)	126.89	C-19, 20,24, 22			
22				7.24 (t)	126.22	C-20,21,23,24			

[a] 500 MHz, $CDCl_3$; chemical shifts in ppm relative to TMS; coupling constant (J) in Hz.
[b] 125MHz, $CDCl_3$

188°C. ^{1}H NMR (DMSO-d_6): δ=9.29 (s, 1H, OH) 8.94 (s, 1H, NH), 7.23 (s, 1H, Ar), 6.94–7.08 (m, 2H, Ar), 6.36–6.48 (m, 1H, Ar), 1.94–2.05 (m, 3H, Ad), 1.82–1.92 (m, 6H, Ad), 1.59–1.77 (m, 6H, Ad) ppm. $^{13}C\{1H\}$ NMR (DMSO-d_6): δ 175.89 (C) 157.40 (C), 140.44 (C), 128.99 (CH), 111.02 (CH), 110.23 (CH), 107.45 (CH), 40.97 (C), 38.33 (3 CH_2), 36.07 (3 CH_2), 27.76 (3 CH) ppm. IR spectrum, ν, cm^{-1}: 3389, 3177, 2901, 2851, 1609, 1532, 1436.

N-(5-Hydroxy-2-nitrophenyl)adamantane-1-carboxamide (2): HNO_3 (65%, 7 mL, 15.00 mmol, 1.4 eq) was added dropwise over 5 min to a suspension of 2.98 g (11.00 mmol, 1 eq) compound **1** in 15 mL acetic acid and the reaction mixture was then stirred for 1 h at room temperature. Subsequently, it was poured into ice and the yellow participate was filtered off and washed with 50 mL water and recrystallized from 10 mL ethanol to

yield 0.86 g (2.74 mmol, 25 %) of the title compound **2** as yellow solid. The filtrate was evaporated and the residue was chromatographed on silica gel (Hexane / EtOAc 3 / 1) to give three fractions: the first, isomer - N-(3-hydroxy-2-nitrophenyl)adamantane-1-carboxamide (R_f = 0.85) was obtained as a red solid (0.10 g, 0.33 mmol, 3 %), the second fraction (R_f = 0.80) the isomer N-(3-hydroxy-4-nitrophenyl)adamantane-1-carboxamide was obtained as yellow solid (1.39 g, 5.13 mmol, 40 %). and the third fraction (R_f = 0.71), the title compound **2** (0.18 g, 0.58 mmol, 5 %) was eluted. The total yield of compound **2** was 1.05 g (3.31 mmol, 30 %). M.p.: 281-285°C. ^{1}H NMR (500 MHz, DMSO-d_6): δ = 11.18 (s, 1H), 10.58 (s, 1H), 8.09 (d, J = 9.3 Hz, 1H), 7.99 (d, J = 2.1 Hz, 1H), 6.63 (dd, J = 2.2 Hz, J = 9.2 Hz, 1H), 1.99-2.11 (m, 3H), 1.85-1.97 (m, 6H), 1.62-1.80 (m, 6H) ppm. ^{13}C{^{1}H} NMR (DMSO-d_6, 125 MHz): δ = 176.30 (C), 164.36 (C), 137.02 (C), 129.72 (C), 128.53 (CH), 111.38 (CH), 107.25 (CH), 41.67 (C), 38.40 (3 CH_2), 35.91 (3 CH_2), 27.56 (3 CH) ppm. IR spectrum, ν, cm^{-1}: 3094, 2920, 2851, 1660, 1598, 1559, 1505, HR-MS (ESI. pos. Mode): calcd. 339.1321 (for $C_{17}H_{20}N_2NaO_4$), found 339.2577 [M + Na+]. Anal. For $C_{17}H_{20}N_2O_4$ (316.37): calcd. C 64.54, H 6.37, N 8.86; found C 64.36, H 6.62, N 8.90.

N-(2-Amino-5-hydroxyphenyl)adamantane-1-carboxamide (3). The catalyst (5% Pt, 1 % Fe, on charcoal, 0.10 g) was added to a solution of 0.78 g (2.37 mmol) compound **2** in 25 mL EtOH and the reaction mixture was stirred at room temperature over 24 h under hydrogen atmosphere. Then catalyst was removed by filtration and residue was evaporated. The crude product was re-crystallized from 10 mL chloroform to give 0.67 g (2.34 mmol, 95%) the title compound **3** as white-grey solid. M.p.; 180-182°C

^{1}H NMR (500 MHz, Methanol-d_4): δ = 6.78 (d, J = 8.5 Hz, 1H), 6.71 (d, J = 2.6 Hz, 1H), 6.57 (dd, J = 2.7 Hz, J = 8.5 Hz, 1H), 2.07-2.12 (m, 3H), 1.98-2.06 (m, 6H), 1.77-1.87 (m, 6H) ppm. ^{13}C{^{1}H} NMR (Methanol-d_4, 125 MHz): δ = 179.47 (C), 151.79 (C), 134.69 (C), 127.55 (C), 120.51 (CH), 114.98 (CH), 113.68 (CH), 42.47 (C), 40.24 (3 CH_2), 37.56 (3 CH_2), 29.70 (3 CH), ppm. IR spectrum, ν, cm^{-1}: 3312, 3006, 2906, 2850, 1629, 1486, HR-MS (ESI. pos. Mode): calcd. 309.1579 (for $C_{17}H_{22}N_2NaO_2$), found 309.2650 [M + Na+]. Anal. For $C_{17}H_{22}N_2O_2$ (286.37): calcd. C 71.30, H 7.74, N 9.78, found C 71.26, H 7.78. N 9.55.

5(6)-Hydroxy-2-(1-adamantyl)benzimidazole (4). 0.10 mL (1.30 mmol, 6 eq) Trifluoroacetic acid was added to a stirred solution of 54 mg (0.20 mmol, 1 eq) compound **3** in 5 mL Toluene. The reaction mixture was refluxed for 6 h and grey-white precipitate was filtered off, washed with toluene and dried in vacuum to yield 50 mg (0.19 mmol, 99 %) of the titled compound **4**. M.p.: 220-222°C. ^{1}H NMR (500 MHz, Methanol-d_4): δ = 7.52-7.55 (m, 1H), 7.03-7.07 (m, 2H), 2.17-2.25 (m, 9H), 1.86-1.96 (m, 6H) ppm. ^{13}C{^{1}H} NMR (Methanol-d_4, 125 MHz): δ = 160.46 (C), 158.07 (C), 133.38 (C), 125.51 (C), 117.08 (CH), 115.27 (CH), 99.16 (CH), 40.94 (3 CH_2), 36.87 (3 CH_2), 36.57 (C), 29.16 (3 CH). IR spectrum, ν, cm^{-1}: 2912, 28.56, 2280, 1778, 1663, 1638, 1503, HR-MS (ESI. pos. Mode): calcd. 291.1473 (for $C_{17}H_{20}N_2NaO$), found 291.2406 [M + Na+].

4(7)-Nitro-5(6)-hydroxy-2-(1-adamantyl) benzimidazole (5). 0.49 g (1.82 mmol, 1 eq) of compound **4** was dissolved in 3 mL acetic acid and 0.12 mL nitric acid (65 %, 2.73 mmol, 1.5 eq) was added dropwise for 5 min. The reaction mixture was stirred at room temperature for 30 min. The reaction mixture was diluted with water (10 mL). The yellow, precipitated crude product was filtered off, washed with water and then purified by column chromatography (SiO_2, EtOAc / hexane 1 / 3) to gave three fractions: The first (R_f = 0.49), the title compound 4 (0.54 g, 0.17 mmol, 44 %) as yellow crystals. Secondly, isomer 6-nitro-5-hydroxy-2-(1-adamantyl) benzimidazole (12 mg, 0.46 mmol, 10%, R_f = 0.32) and the third fraction the dinitro product – 4,6-dinitro-5-hydroxy-2-(1-adamantyl)

benzimidazole (49 mg, 0.14 mmol, 3%, R_f = 0.15) was isolated. Compound **5**: M.p.: 187-188°C. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 10.98 (br, s, 1H), 10.24 (br, s, 1H), 8.00 (d, J = 8.8 Hz, 1H), 7.05 (d, J = 8.8 Hz, 1H), 1.99-2.15 (m, 9 H), 1.69-1.85 (m, 6 H) ppm. ^{13}C{^{1}H} NMR ($CDCl_3$, 125 MHz): δ = 162.41 (C), 153.87 (C), 136.38 (C), 129.82 (CH), 127.68 (C), 120.75 (C), 113.52 (CH), 41.09 (3 CH_2), 36.29 (3 CH_2), 35.51(C), 28.05 (3 CH) ppm. IR spectrum, ν, cm^{-1}: 3435, 3016, 2906, 2854, 2356, 2052, 1966, 1626, 1601, 1509. HR-MS (ESI. pos. Mode): calcd. 336.1324 (for $C_{17}H_{19}N_3NaO_3$), found 336.2525 [M + Na+]. Anal. For $C_{17}H_{19}N_3O_3$ (313.35): calcd. C 65.16, H 6.11, N 13.41. found C 65.22, H 6.19. 13.54.

4(7)-Nitro-5(6)-benzyloxy-2-(1-adamantyl) benzimidazole (7). 73 mg (0.51 mmol, 1.5 eq) K_2CO_3 was added to a solution of 94 mg (0.34 mmol, 1 eq) compound **5** in 10 mL acetone. The reaction mixture was stirring for 15 min and then 0.06 g (0.34 mmol, 1 eq) benzyl bromide was added. The reaction mixture was refluxed for 7 hours and subsequently poured into water. The yellow precipitate was filtered off and washed with water. The crude product was purified by column chromatography (SiO_2, Hexane / EtOAc, 2 : 1) (R_f = 0.49) to give 81 mg (0.20 mmol, 67 %) the title compound **7** as yellow crystals. M.p.: 208-210°C. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 10.17 (s, 1H), 7.78 (d, J = 8.9 Hz, 1H), 7.44 (d, J = 7.6 Hz, 2H), 7.30 (t, J = 7.4 Hz, 2H), 7.24 (t, J = 7.3 Hz, 1H), 6.92 (d, J = 8.9, 1 H), 5.22 (s, 2 H), 1.97-2.10 (m, 9 H), 1.62-1.80 (m, 6 H) ppm. ^{13}C{^{1}H} NMR ($CDCl_3$, 125 MHz): δ = 163.53 (C), 151.60 (C), 138.86 (C), 135.86 (C Ar), 130.35 (C), 128.74 (2 CH Ar), 128.24 (CH), 126.89 (2 CH Ar), 126.22 (CH Ar), 124.12 (C), 109.50 (CH), 72.25 (CH_2), 41.24 (3 CH_2), 36.45 (3 CH_2), 35.54 (C), 28.15 (3 CH) ppm. IR spectrum, ν, cm^{-1}: 3391, 3063, 2901, 2849, 2322, 2164, 2049, 1857, 1633, 1587, 1502, HR-MS (ESI. pos. Mode): calcd. 426.1794 (for $C_{24}H_{25}N_3NaO_3$), found 426.3391 [M + Na+]. Anal. For $C_{24}H_{25}N_3O_3$ (403.19): calcd. C 71.44, H 6.25, N 10.41; found C 71.47, H 6.32, N 10.10.

4(7)-Nitro-5(6)-methoxy-2-(1-adamantyl) benzimidazole (6). The mixture of 67 mg (0.21 mmol, 1 eq) Compound **5** and 30 mg (0.21 mmol, 1 eq) K_2CO_3 in 20 mL acetone was stirred for 10 min. Then 0.02 mL methyl iodide was added and red reaction mixture was refluxed for 32 h. Afterwards the reaction mixture was poured into 50 mL water and yellow precipitate was filtered off and washed with water and dried. The crude product was purified by column chromatography (Silica, Hexane / EtOAc, 2 / 1) (R_f = 0.37) to give 28 mg (40 %, 0.08 mmol) the title compound **6** as yellow solid. M.p.: 139-142°C. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 10.20 (s, 1 H), 7.91 (d, J = 8.8 Hz, 1 H – 6), 6.95 (d, J = 8.9, 1 H – 7), 4.03 (s, 3 H), 2.02 – 2.12 (m, 9 H), 1.71 – 1.82 (m, 6 H) ppm. ^{13}C{^{1}H} NMR ($CDCl_3$, 125 MHz): δ = 163.42 (C 2), 152.84 (C 5), 138.81 (C 7a), 130.52 (C 4), 127.15 (CH 7), 123.77 (C 4a), 107.65 (CH 6), 57.51 (CH_3), 41.34 (3 CH_2), 36.53 (3 CH_2), 29.40 (C), 28.25 (3 CH) ppm. IR spectrum, ν, cm^{-1}: 3471, 2904, 2847, 2038, 1636, 1585, 1504. HR-MS (ESI. pos. Mode): calcd. 328.1661(for $C_{18}H_{22}N_3O_3$), found 328.1663 [M + H+].

1-Methyl-4-nitro-5-hydroxy-2-(1-adamantyl) benzimidazole (8). The mixture of 125 mg (0.4 mmol, 1 eq) compound 5 and 20 mg (0.4 mmol, 1 eq) NaH in abs. THF was stirred over 25 min and then 0.03 mL (0.4 mmol) methyl iodide was added and reaction mixture was refluxed for 8 h. Afterwards, the mixture was poured into 20 mL water and red precipitate was filtered off and washed with water and dried. The crude product was purified by column chromatography (Silica gel, Hexane / EtOAc, 2 / 1) and gave three fractions: The first (R_f = 0.68), 67 mg (0.21 mmol) starting compound 5. The second (R_f = 0.45), 33 mg (0.10 mmol, 25 %) the title compound 8 as yellow solid and the third fraction (R_f = 0.37), 7 mg (0.02 mmol, 5 %) compound 6 as yellow crystals. M.p.; 153-155°C. ^{1}H NMR (500 MHz, $CDCl_3$): δ = 11.26

(s, 1 H), 7.49 (d, J = 8.6 Hz, 1 H), 7.00 (d, J = 8.9 Hz, 1 H), 3.98 (s, 3 H), 2.18 – 2.27 (m, 6 H), 2.0 – 2.15 (m, 3 H), 1.69 – 1.84 (m, 6 H) ppm. $^{13}C\{1H\}$ NMR ($CDCl_3$, 125 MHz): δ = 163.83 (C 2), 153.76 (C 5), 136. 80 (C 4a), 132.28 (C 7a), 125.15 (C 4), 118.09 (CH 7), 113.22 (CH 6), 40.10 (3 CH_2), 37.01(C), 36.62 (3 CH_2), 32.84 (CH_3), 28.40 (3 CH) ppm. IR spectrum, ν, cm-1: 2918, 2850, 2366, 1605, 1518, HR-MS (ESI. pos. Mode): calcd. 350.1481 (for $C_{18}H_{21}N_3NaO_3$), found 350.1031 [M + Na+].

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ორგანული ქიმია

5(6)-ჰიდროქსი-4(7)-ნიტრო-2-(1-ადამანტილ) ბენზიმიდაზოლის O- და N-მეთილ წარმოებულების სინთეზი

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***აკადემიის წევრი, ივანე ჯავახიშვილის სახ. თბილისის სახელმწიფო უნივერსიტეტი, ზუსტ და საბუნებისმეტყველო მეცნიერებათა ფაკულტეტი, თბილისი, საქართველო*

სინთეზირებულ იქნა 5(6)-ალკოქსი-4(7)-ნიტრო-2-(1-ადამანტილ) ბენზიმიდაზოლის წარმოებულები, სადაც ალკილი არის მეთილი, ბენზილი. O- და N-ალკილირების რეაქცია შესწავლილ იქნა მეთილ იოდიდით NaH ან K_2CO_3-ის არეში. მათი სტრუქტურა ზუსტად იქნა დადგენილი სპექტროსკოპიული ანალიზებით 1D და 2D ბმრ ტექნიკის გამოყენებით. ბენზიმიდაზოლის ბირთვის ფორმირება განხორციელდა ოთხი სინთეზის საფეხურის გავლით დაწყებული 1-ადამანტან კარბონმჟავას ქლორანჰიდრიდის კონდენსაციით 3-ამინოფენოლთან და მიღებული ამიდის შემდგომი ნიტრირების, აღდგენის და მჟავათი-კატალიზირებული ციკლირების გზით.

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