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SYNTHESIS AND CONVERSIONS OF POLYHEDRAL COMPOUNDS. 30*. SYNTHESIS OF 2-SUBSTITUTED 6-AMINO-5,7-DIMETHYL-1,3-DIAZAADAMANTANES

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A method has been developed for the synthesis of 6-amino-5,7-dimethyl-1,3-diazaadamantanes containing various aliphatic, aromatic, and heterocyclic groups in position 2.

Keywords: adamantane, 6-amino-1,3-diazaadamantane, 1,3-diazaadamantane, 3,7-diazabicyclo-[3.3.1]nonane, oxime, condensation.

Amino derivatives of adamantane (amantadine, rimantadine, gludantan, memantine, etc.) have been known for a fairly long time, and are widely used in medical practice [2]. Of the amino derivatives of 1,3-diazaadamantane, only 6-amino-5,7-dimethyl-1,3-diazaadamantane is known, possessing psychotropic activity [3, 4].

Investigation of the biological activity of 2-substituted 1,3-diazaadamantane derivatives, previously synthesized by us, revealed significant antitumor, psychotropic, antibacterial, and antioxidant action of some of them. With the aim of further search for biologically active compounds in the 1,3-diazaadamantane series, a method was developed by us for the synthesis of 2-substituted 6-amino-5,7-dimethyl-1,3-diazaadamantanes.

2-Substituted 6-oxo- and 6-hydroxy-1,3-diazaadamantanes may be synthesized by the condensation of 9-oxo- and 9-hydroxy-3,7-diazabicyclo[3.3.1]nonanes with various aldehydes and ketones [5]. However, it is not possible to obtain 2-substituted 6-amino-1,3-diazaadamantanes by this method, since the amino group of 9-amino-3,7-diazabicyclo[3,3.1]nonane (the necessary starting compound for the synthesis of 2-substituted 6-amino-1,3-diazaadamantanes) also interacts with aldehydes and ketones. Consequently, we chose the 1,5-dimethyl-3,7-diaza-bicyclo[3.3.1]nonan-9-one oxime (**2**) as the starting material, which was synthesized by the condensation of oxime **1** with various aldehydes and ketones led to the corresponding oximes of 2-substituted 1,3-diazaadamantanes **3a-j**. 6-Amino-1,3-diazaadamantanes **4a-j** were obtained by the reduction of the latter with $LiAlH_4$.

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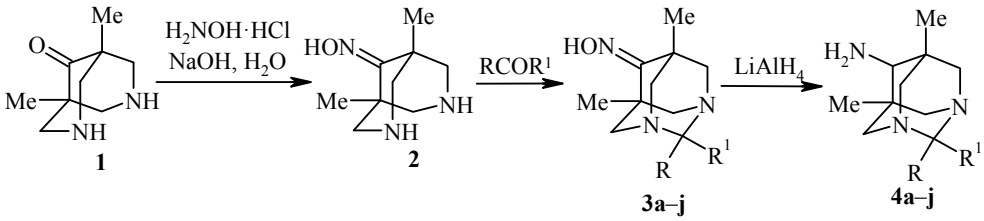

3, **4** **a** R = R^1 = Me; **b** R+R^1 = $(CH_2)_5$; **c**–**j** R = H, **c** R^1 = Ph, **d** R^1 = 2-furyl, **e** R^1 = 2-thienyl, **f** R^1 = 4-$MeOC_6H_4$, **g** R^1 = 4-(*i*-Pr)C_6H_4, **h** R^1 = piperonyl, **i** R^1 = 1-naphthyl, **j** R^1 = 1-methylindol-3-yl

TABLE 1. Physicochemical Characteristics of Compounds **3a-j, 4a-j**

Compound	Empirical formula	Found, % / Calculated, %			Mp, °C	R_f (eluent)	Yield, %
		C	H	N			
3a	$C_{12}H_{21}N_3O$	64.71 / 64.54	9.30 / 9.48	18.67 / 18.82	270-271 (subl.)	0.35 (A)	87
3b	$C_{15}H_{25}N_3O$	68.23 / 68.40	9.71 / 9.57	16.07 / 15.95	210-211	0.54 (A)	92
3c	$C_{16}H_{21}N_3O$	71.03 / 70.82	7.90 / 7.80	15.71 / 15.48	195-196	0.78 (A)	86
3d	$C_{14}H_{19}N_3O_2$	64.20 / 64.35	7.08 / 7.33	15.88 / 16.08	212-213	0.72 (A)	89
3e	$C_{14}H_{19}N_3OS$*	60.47 / 60.62	7.10 / 6.90	14.92 / 15.15	257-258 (subl.)	0.27 (B)	77
3f	$C_{17}H_{23}N_3O_2$	67.48 / 67.75	7.44 / 7.69	13.69 / 13.94	260-261	0.76 (A)	91
3g	$C_{19}H_{27}N_3O$	72.58 / 72.81	8.87 / 8.68	13.14 / 13.41	201-202	0.80 (A)	74
3h	$C_{17}H_{21}N_3O_3$	64.39 / 64.74	6.37 / 6.71	13.00 / 13.32	260-261 (subl.)	0.73 (A)	67
3i	$C_{20}H_{23}N_3O$	74.76 / 74.74	7.02 / 7.21	12.79 / 13.07	218-219	0.78 (A)	86
3j	$C_{19}H_{24}N_4O$	70.65 / 70.34	7.25 / 7.46	17.37 / 17.27	257-258	0.69 (A)	56
4a	$C_{12}H_{23}N_3$	68.61 / 68.85	10.87 / 11.07	20.21 / 20.07	76-77	0.24 (A)	55
4b	$C_{15}H_{27}N_3$	72.37 / 72.24	10.60 / 10.91	16.90 / 16.85	85-86	0.33 (B)	73
4c	$C_{16}H_{23}N_3$	75.02 / 74.67	8.76 / 9.01	16.60 / 16.33	103-104	0.27 (A)	75
4d	$C_{14}H_{21}N_3O$	68.10 / 67.98	8.35 / 8.56	17.21 / 16.99	77-78	0.33 (A)	72
4e	$C_{14}H_{21}N_3S$*[2]	63.68 / 63.84	7.98 / 8.04	16.11 / 15.95	132-133	0.30 (A)	61
4f	$C_{17}H_{25}N_3O$	70.79 / 71.05	8.66 / 8.77	14.52 / 14.62	94-95	0.29 (A)	67
4g	$C_{19}H_{29}N_3$	76.51 / 76.21	9.58 / 9.76	13.95 / 14.03	92-94	0.21 (A)	72
4h	$C_{17}H_{23}N_3O_2$	67.62 / 67.75	7.44 / 7.69	13.95 / 13.94	145-146	0.34 (A)	69
4i	$C_{20}H_{25}N_3$	78.01 / 78.14	8.43 / 8.20	13.81 / 13.67	95-96	0.28 (A)	57
4j	$C_{19}H_{26}N_4$	73.26 / 73.51	8.60 / 8.44	18.23 / 18.05	153-154	0.38 (B)	61

*Found, %: S 11.33. Calculated, %: S 11.56.

*[2]Found, %: S 11.93. Calculated, %: S 12.17.

TABLE 2. Spectral Characteristics of Synthesized Compounds **3, 4 a-j**.

Compound	IR spectrum, ν, cm^{-1}	^1H NMR spectrum, δ, ppm (*J*, Hz)
1	2	3
3a	1645 (C=N), 3165 (OH)	0.81 (3H, s, CH_3); 1.29 (3H, s, CH_3); 1.43 (3H, s) and 1.45 (3H, s, $C(CH_3)_2$); 2.61-2.67 (2H, m), 2.79-2.84 (2H, m), 3.24-3.31 (2H, m) and 3.40-3.47 (2H, m, $4NCH_2$); 9.62 (1H, s, OH)
3b	1620 (C=N), 3180 (OH)	0.81 (3H, s, CH_3); 1.30 (3H, s, CH_3); 1.40-1.54 (6H, m) and 1.84-1.92 (4H, m, C_6H_{10}); 2.59 (2H, br. d, *J* = 13.3), 2.76 (2H, br. d, *J* = 13.6), 3.24 (2H, br. d, *J* = 13.6) and 3.40 (2H, br. d, *J* = 13.3, $4NCH_2$); 9.60 (1H, s, OH)
3c	1652 (C=N), 3205 (OH)	0.66 (1.8H, s) and 0.91 (1.2H, s, CH_3); 1.12 (1.2H, s) and 1.39 (1.8H, s, CH_3); 2.65 (1.2H, br. d, *J* = 12.8), 2.83 (1.8H, s), 2.97-3.18 (3H, m) and 3.24-3.35 (2H, m, $4NCH_2$); 4.94 (0.6H, s) and 4.96 (0.4H, s, NCHN); 7.18-7.24 (1H, m, H-4'); 7.28-7.34 (2H, m, H-3',5'); 7.52-7.57 (2H, m, H-2',6'); 9.72 (0.4H, s) and 9.76 (0.6H, s, OH)
3d	1660 (C=N), 3200 (OH)	0.72 (1.5H, s) and 0.87 (1.5H, s, CH_3); 1.18 (1.5H, s) and 1.35 (1.5H, s, CH_3); 2.69 (1H, br. d, *J* = 12.8), 2.83-2.98 (2H, m), 3.00-3.15 (3H, m) and 3.18-3.25 (2H, m, $4NCH_2$); 4.93 (0.5H, s) and 4.95 (0.5H, s, NCHN); 6.25-6.29 (1H, m) and 6.35-6.38 (1H, m, H-3',4'); 7.40-7.43 (1H, m, H-5'); 9.76 (0.5H, s) and 9.78 (0.5H, s, OH)
3e	1670 (C=N), 3200-3220 (OH)	0.70 (1.2H, s) and 0.89 (1.8H, s, CH_3); 1.17 (1.8H, s) and 1.37 (1.2H, s, CH_3); 2.68 (0.8H, br. d, *J* = 12.7), 2.86 (1.2H, br. d, *J* = 12.7), 3.04-3.12 (3.2H, m) and 3.21-3.30 (2.8H, m, $4NCH_2$); 5.09 (0.4H, s) and 5.11 (0.6H, s, NCHN); 6.93-6.99 (2H, m, H-3',4'); 7.23-7.27 (1H, m, H-5'); 9.76 (0.6H, s) and 9.80 (0.4H, s, OH).
3f	1660 (C=N), 3483 (OH)	0.65 (1.5H, s) and 0.90 (1.5H, s, CH_3); 1.11 (1.5H, s) and 1.37 (1.5H, s, CH_3); 2.62 (1H, br. d, *J* = 12.6), 2.77-2.87 (2H, m), 2.97-3.15 (3H, m) and 3.21-3.33 (2H, m, $4NCH_2$); 3.79 (3H, s, OCH_3); 4.88 (0.5H, s) and 4.90 (0.5H, s, NCHN); 6.80-6.85 (2H, m) and 7.39-7.44 (2H, m, H Ar); 9.70 (0.5H, s) and 9.74 (0.5H, s, OH).
3g	1640 (C=N), 3160 (OH)	0.66 (1.5H, s) and 0.90 (1.5H, s, CH_3); 1.13 (1.5H, s) and 1.38 (1.5H, s, CH_3); 1.27 (6H, d, *J* = 6.9, $CH(C\underline{H}_3)_2$); 2.64 (1H, br. d, *J* = 12.7), 2.78-2.88 (2H, m), 2.99-3.16 (3H, m) and 3.22-3.34 (2H, m, $4NCH_2$); 2.90 (1H, sept., *J* = 6.9, $C\underline{H}(CH_3)_2$); 4.88 (0.5H, s) and 4.91 (0.5H, s, NCHN); 7.12-7.18 (2H, m) and 7.40-7.45 (2H, m, H Ar); 9.70 (0.5H, s) and 9.74 (0.5H, s, OH).
3h	1660 (C=N), 3225 (OH)	0.67 (1.5H, s) and 0.89 (1.5H, s, CH_3); 1.13 (1.5H, s) and 1.37 (1.5H, s, CH_3); 2.63 (1H, br. d, *J* = 12.6), 2.78-2.88 (2H, m), 2.98-3.15 (3H, m) and 3.20-3.32 (2H, m, $4NCH_2$); 4.83 (0.5H, br. s) and 4.85 (0.5H, br. s, NCHN); 5.95 (2H, s, OCH_2O); 6.73-6.77 (1H, m) and 7.00-7.04 (2H, m, H Ar); 9.72 (0.5H, s) and 9.76 (0.5H, s, OH)
3i	1660 (C=N), 3220-3240 (OH)	0.69 (1.5H, s) and 0.96 (1.5H, s, CH_3); 1.15 (1.5H, s) and 1.44 (1.5H, s, CH_3); 2.75 (1H, br. d, *J* = 12.7), 2.89-3.01 (2H, m), 3.12-3.52 (5H, m, $4NCH_2$); 5.41 (0.5H, br. s) and 5.43 (0.5H, br. s, NCHN); 7.32-7.45 (3H, m), 7.72-7.80 (3H, m) and 8.85-8.91 (1H, m, H Ar); 9.75 (0.5H, s) and 9.80 (0.5H, s, OH)
3j	1638 (C=N), 3608 (OH)	0.66 (1.2H, s) and 0.90 (1.8H, s, CH_3); 1.13 (1.8H, s) and 1.39 (1.2H, s, CH_3); 2.68 (0.8H, br. d, *J* = 12.7), 2.85 (1.2H, br. d, *J* = 12.8), 3.11-3.19 (3H, m) and 3.25-3.37 (3H, m, $4NCH_2$); 3.81 (3H, s, NCH_3); 5.18 (0.4H, br. s) and 5.20 (0.6H, br. s, NCHN); 6.88-6.94 (1H, m), 7.04-7.10 (2H, m) and 7.22-7.26 (1H, m, H Ar); 7.85 (0.6H, s) and 7.88 (0.4H, s, H-2'); 9.67 (0.6H, s) and 9.72 (0.4H, s, OH)

TABLE 2 (continued)

1	2	3
4a	3380, 3300 (NH_2)	0.59 (6H, s, $2CH_3$); 1.08 (2H, br. s, NH_2); 1.35 (6H, s, $C(CH_3)_2$); 2.38 (1H, s, $NH_2C\underline{H}$); 2.43-2.53 (2H, m), 2.84-2.95 (4H, m) and 3.24-3.30 (2H, m, $4NCH_2$)
4b	3380, 3300 (NH_2)	0.60 (6H, s, $2CH_3$); 1.15 (2H, br. s, NH_2); 1.35-1.51 (6H, m) and 1.77-1.83 (4H, m, C_6H_{10}); 2.38 (1H, s, $NH_2C\underline{H}$); 2.37-2.44 (2H, m), 2.79-2.91 (4H, m) and 3.20-3.27 (2H, m, $4NCH_2$)
4c	3380, 3295 (NH_2), 1610, 1600, 1580 (arom.)	0.46 (3H, s, CH_3); 0.71 (3H, s, CH_3); 1.15 (2H, br. s, NH_2); 2.56 (1H, s, $NH_2C\underline{H}$); 2.45-2.54 (2H, m), 2.74 (1H, dt, ^2J = 13.0, ^4J = 1.5), 2.81-2.89 (2H, m), 3.01 (1H, dd, ^2J = 12.9, ^4J = 3.1), 3.10 (1H, dd, ^2J = 12.9, ^4J = 2.1) and 3.40 (1H, dd, ^2J = 13.0, ^4J = 3.1, $4NCH_2$); 4.79 (1H, s, NCHN); 7.13-7.20 (1H, m, H-4'); 7.24-7.31 (2H, m, H-3',5'); 7.49-7.53 (2H, m, H-2',6')
4d	3368, 3284 (NH_2), 1604,1501 (arom.)	0.52 (3H, s, CH_3); 0.68 (3H, s, CH_3); 1.15 (2H, br. s, NH_2); 2.55 (1H, s, $NH_2C\underline{H}$); 2.50-2.56 (1H, m), 2.61 (1H, dt, ^2J = 13.4, ^4J = 1.5), 2.67 (1H, dt, ^2J = 13.0, ^4J = 1.5), 2.87-3.06 (4H, m) and 3.30 (1H, dd, ^2J = 13.1, ^4J = 3.1, $4NCH_2$); 4.77 (1H, s, NCHN); 6.21 (1H, dd, ^3J = 3.1, ^4J = 1.0, H-3'); 6.33 (1H, dd, ^3J = 3.1, ^3J = 1.9, H-4'); 7.37 (1H, dd, ^3J = 1.9, ^4J = 1.0, H-5')
4e	3370, 3285 (NH_2), 1630-1640, 1550 (arom.)	0.50 (3H, s, CH_3); 0.70 (3H, s, CH_3); 1.13 (2H, br. s, NH_2); 2.56 (1H, s, $NH_2C\underline{H}$); 2.50-2.55 (1H, m), 2.70-2.77 (2H, m), 2.87-2.97 (2H, m), 3.05-3.12 (2H, m) and 3.34 (1H, dd, ^2J = 13.0, ^4J = 3.0, $4NCH_2$); 4.93 (1H, s, NCHN); 6.90-6.94 (2H, m, H-3',4'); 7.19-7.22 (1H, m, H-5')
4f	3375, 3305 (NH_2), 1600, 1585, 1495 (arom.)	0.45 (3H, s, CH_3); 0.70 (3H, s, CH_3); 1.13 (2H, br. s, NH_2); 2.54 (1H, s, $NH_2C\underline{H}$); 2.45 (1H, dd, ^2J = 13.2, ^4J = 3.0), 2.48-2.54 (1H, m), 2.72 (1H, dt, ^2J = 13.0, ^4J = 1.5), 2.82 (1H, dd, ^2J = 13.1, ^4J = 3.2), 2.84 (1H, dd, ^2J = 13.2, ^4J = 2.2), 2.98 (1H, dd, ^2J = 13.0, ^4J = 3.2), 3.08 (1H, dd, ^2J = 13.0, ^4J = 2.2) and 3.38 (1H, dd, ^2J = 13.0, ^4J = 3.1, $4NCH_2$); 3.78 (3H, s, OCH_3); 4.73 (1H, s, NCHN); 6.77-6.82 (2H, m) and 7.36-7.41 (2H, m, H Ar)
4g	3370, 3305 (NH_2), 1610 (arom.)	0.46 (3H, s, CH_3); 0.70 (3H, s, CH_3); 1.13 (2H, br. s, NH_2); 1.26 (6H, d, ^3J = 6.9, $CH(C\underline{H}_3)_2$); 2.54 (1H, s, $NH_2C\underline{H}$); 2.46 (1H, dd, ^2J = 13.2, ^4J = 3.1), 2.72 (1H, dt, ^2J = 13.0, ^4J = 1.5), 2.79-2.91 (3H, m), 2.98 (1H, dd, ^2J = 13.0, ^4J = 3.0), 3.08 (1H, dd, ^2J = 13.0, ^4J = 2.0) and 3.38 (1H, dd, ^2J = 13.0, ^4J = 3.1, $4NCH_2$); 2.88 (1H, sept., ^3J = 6.9, $C\underline{H}(CH_3)_2$); 4.73 (1H, s, NCHN); 7.10-7.14 (2H, m) and 7.36-7.41 (2H, m, H Ar)
4h	3390, 3330 (NH_2), 1610, 1500 (arom.)	0.47 (3H, s, CH_3); 0.69 (3H, s, CH_3); 1.15 (2H, br. s, NH_2); 2.54 (1H, s, $NH_2C\underline{H}$); 2.46 (1H, dd, ^2J = 13.2, ^4J = 3.1), 2.49-2.53 (1H, m), 2.70 (1H, dt, ^2J = 13.0, ^4J = 1.5), 2.83 (1H, dd, ^2J = 13.1, ^4J = 3.2), 2.85 (1H, dd, ^2J = 13.2, ^4J = 2.2), 2.97 (1H, dd, ^2J = 13.0, ^4J = 3.1), 3.06 (1H, dd, ^2J = 13.0, ^4J = 2.2) and 3.37 (1H, dd, ^2J = 13.0, ^4J = 3.1, $4NCH_2$); 4.68 (1H, s, NCHN); 5.93 (2H, s, OCH_2O); 6.70-6.74 (1H, m) and 6.97-7.00 (2H, m, H Ar)
4i	3380, 300 (NH_2), 1620, 1595, 1505 (arom.)	0.50 (3H, s, CH_3); 0.76 (3H, s, CH_3); 1.17 (2H, br. s, NH_2); 2.56 (1H, s, $NH_2C\underline{H}$); 2.55-2.67 (2H, m), 2.92-3.02 (3H, m), 3.09 (1H, dd, ^2J = 13.0, ^4J = 3.2), 3.32 (1H, dd, ^2J = 13.0, ^4J = 2.1) and 3.49 (1H, dd, ^2J = 13.1, ^4J = 3.2, $4NCH_2$); 5.26 (1H, s, NCHN); 7.30-7.43 (3H, m), 7.69-7.78 (3H, m) and 8.89-8.93 (1H, m, H Ar)
4j	3390, 3340 (NH_2), 1610, 1540 (arom.)	0.46 (3H, s, CH_3); 0.70 (3H, s, CH_3); 1.12 (2H, br. s, NH_2); 2.56 (1H, s, $NH_2C\underline{H}$); 2.49-2.54 (1H, m), 2.78-2.92 (3H, m), 2.99 (1H, dd, ^2J = 13.0, ^4J = 3.2), 3.11-3.20 (2H, m) and 3.38 (1H, dd, ^2J = 12.8, ^4J = 3.1, $4NCH_2$); 3.80 (3H, s, NCH_3); 5.04 (1H, s, NCHN); 7.03 (1H, s, H-2'); 6.89 (1H, ddd, ^3J = 7.9, ^3J =7.0, ^4J = 1.0), 7.05 (1H, ddd, ^3J = 7.9, ^3J = 7.0, ^4J = 1.2), 7.21 (1H, dt, ^3J = 7.9, ^4J =1.0) and 7.88 (1H, dt, ^3J = 7.9, ^4J = 1.0, H Ar)

TABLE 3. Mass Spectra of the Synthesized Compounds **4b-f,h-j**

Com-pound	*m/z* (I_{rel},%)
4b	249 $[M]^+$ (11), 248 $[M-H]^+$ (51), 189 (11), 151 (27), 149 (12), 125 (15), 124 (100), 123 (15), 122 (16), 110 (17), 109 (31), 107 (12), 97 (14), 96 (12), 80 (12), 69 (43)
4c	258 $[M+H]^+$ (20), 257 $[M]^+$ (100), 241 $[M-NH_2]^+$ (7), 187 (6), 160 (47), 158 (11), 144 (16), 134 (13), 125 (11), 122 (11), 118 (14), 112 (18), 92 (33), 84 (14), 82 (13), 70 (63)
4d	248 $[M+H]^+$ (16), 247 $[M]^+$ (100), 230 $[M-H-NH_2]^+$ (17), 202 (15), 188 (16), 187 (19), 176 (20), 162 (18), 150 (23), 149 (81), 148 (18), 147 (19), 136 (18), 135 (21), 133 (22), 124 (21), 123 (22), 122 (24), 110 (34), 109 (24), 107 (34), 94 (22), 92 (20), 82 (21), 80 (29), 69 (60)
4e	264 $[M+H]^+$ (21), 263 $[M]^+$ (100), 247 $[M-NH_2]^+$ (5), 165 (47), 152 (10), 149 (14), 24 (23), 123 (16), 121 (12), 111 (10), 110 (27), 109 (17), 96 (24), 83 (10), 69 (46)
4f	288 $[M+H]^+$ (19), 287 $[M]^+$ (100), 271 $[M-NH_2]^+$ (11), 257 (39), 217 (11), 190 (63), 188 (14), 174 (19), 160 (23) 148 (19), 136 (12), 135 (19), 134 (93), 123 (19), 122 (42), 109 (13), 92 (22), 82 (17), 70 (83)
4h	302 $[M+H]^+$ (27), 301 $[M]^+$ (100), 285 $[M-NH_2]^+$ (19), 257 (11), 242 (16), 231 (17), 205 (24), 204 (55), 202 (22), 188 (32), 175 (14), 162 (27), 154 (36), 150 (20), 149 (25), 148 (56), 135 (16), 123 (20), 122 (19), 110 (14), 108 (18), 95 (12), 84 (16), 82 (21), 77 (19), 70 (44)
4i	308 $[M+H]^+$ (23), 307 $[M]^+$ (100), 291 $[M-NH_2]^+$ (11), 210 (49), 208 (12), 194 (21), 68 (19), 167 (13), 166 (12), 155 (63), 154 (13), 142 (31), 132 (13), 85 (10), 71 (59)
4j	311 $[M+H]^+$ (24), 310 $[M]^+$ (100), 294 $[M-NH_2]^+$ (18), 214 (12), 213 (68), 197 (15), 187 (13), 172 (17), 160 (14), 159 (23), 158 (76), 156 (13), 145 (44), 71 (30)

The obtained compounds are of interest as potential biologically active substances. The developed method of synthesis has shown its effectiveness and is versatile for the synthesis of 2-substituted 6-amino-1,3-diazaadamantanes.

The structures of the synthesized compounds were confirmed by data of elemental analysis, IR, ^{1}H NMR, and mass spectra (Tables 1-3). Doubling of all proton signals was observed in the ^{1}H NMR spectra of oximes **3a-j**, which indicated the presence of two stereoisomers in all compounds. In the ^{1}H NMR spectra of 6-amino-1,3-diazaadamantanes **4a-j** there were characteristic broad singlets for amino group protons at 1.08-1.17 ppm, and a singlet for the proton at the C-6 atom in the region of 2.38-2.56 ppm. In the mass spectra of compounds **4b-f,h-j**, the peaks of the molecular ions $[M]^+$ had maximum intensity (with the exception of compound **4b**), which indicated the stability of the molecular ions of these compounds.

A convenient and universal method has therefore been found for the synthesis of previously unavailable 2-substituted 6-amino-1,3-diazaadamantanes.

EXPERIMENTAL

The IR spectra were recorded on a UR-20 spectrometer in nujol. The ^{1}H NMR spectra were recorded on a Varian Mercury-300 VX instrument (300 MHz) in DMSO-D_6, with TMS as internal standard. The mass spectra were recorded on a MX-1321A instrument with direct sample injection into the ion source, the ionization voltage was 50 eV. The progress of reactions and the purity of the obtained compounds was monitored by TLC on Silufol UV-254 plates in the systems: *n*-PrOH–H_2O, 7:3 (A) and *n*-BuOH–saturated NH_3 (B). The starting ketone **1** was synthesized by the procedure of [5].

1,5-Dimethyl-3,7-diazabicyclo[3.3.1]nonan-9-one Oxime (2). $H_2NOH \cdot HCl$ (16.0 g, 0.23 mol) dissolved in H_2O (70 ml) and NaOH (18.0 g, 0.45 mol) dissolved in H_2O (40 ml) were added slowly with stirring to a solution of compound **1** (28.5 g, 0.17 mol) in H_2O (80 ml). The mixture was boiled in an open

flask for 2 h and left overnight. The solid was filtered off, washed with a small amount of cold water, dried, and recrystallized from EtOH. Yield 25.0 g (81%). White crystals; mp 190-191°C, R_f 0.33 (B). IR spectrum, ν, cm^{-1}: 1660 (C=N), 3180 (OH), 3340 (NH). ^1H NMR spectrum, δ, ppm: 0.82 (3H, s, CH_3); 1.28 (3H, s, CH_3); 2.64-2.70 (2H, m), 2.81-2.90 (4H, m), and 2.98-3.04 (2H, m, $4NCH_2$); 2.80 (2H, br. s, NH); 9.73 (1H, s, OH). Found, %: C 58.75; H 9.60; N 22.87. $C_9H_{17}N_3O$. Calculated, %: C 58.99; H 9.35; N 22.93.

5,7-Dimethyl-6-oxo-1,3-diazaadamantane Oximes 3a-j (General Method). The corresponding aldehyde or ketone (0.01 mol) was added to a solution of oxime **2** (1.83 g, 0.01 mol) in EtOH (30 ml) (for compound **3a** in acetone (30 ml)), and the mixture was refluxed for 2-3 h. The precipitate was filtered off, dried, and recrystallized from EtOH.

6-Amino-5,7-dimethyl-1,3-diazaadamantanes 4a-j (General Method). The corresponding oxime **3a-j** (15 mmol) was added gradually to a mixture of $LiAlH_4$ (1.5 g, 40 mmol) in abs. THF (100 ml). The mixture was left for 30 min and then carefully heated to reflux (exothermic reaction). Refluxing was continued until disappearance of the starting oxime (7-10 h). Water (12 ml) was added dropwise with cooling and stirring, then the same volume of 10% NaOH solution was added, and the mixture was left overnight. The solid was filtered off and washed with THF. The solvent was distilled off, and the residue recrystallized from hexane.

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