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Long-Chain Functionally Substituted Aromatic Schiff Bases Derived from Cetylamine

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Abstract—New long-chain functionally substituted aromatic Schiff bases containing alkoxy and acyloxy groups, as well as carborane fragments, were synthesized by condensation of the corresponding benzaldehydes of the vanillin series with cetylamine.

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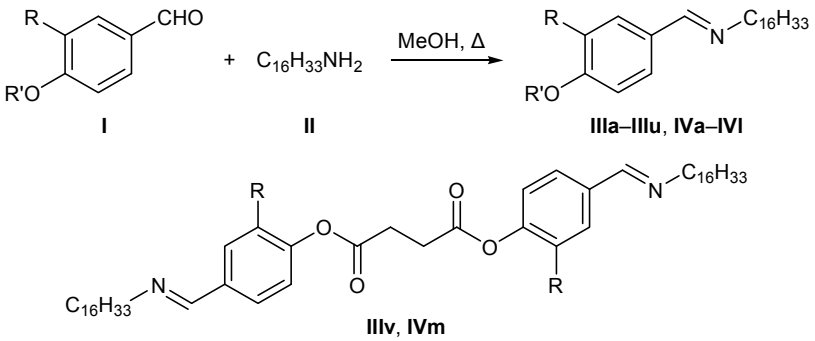
We previously reported on the synthesis of (*E*)-*N*-(4-acyloxy-3-alkoxybenzylidene)octadecan-1-amines [1]. Long-chain aromatic Schiff bases are promising compounds for the preparation of vacuum-deposited nanofilms and Langmuir–Blodgett films necessary for the manufacture of nanomaterials based thereon [2, 3].

The goal of the present work was to develop a procedure for the preparation of new long-chain functionally substituted aromatic Schiff bases containing alkoxy and acyloxy groups and carborane fragments. Compounds **IIIa**–**IIIv** and **IVa**–**IVm** were synthesized by condensation of the corresponding substituted benzaldehydes **I** of the vanillin series with cetylamine (**II**) which is used as flotation agent in industry [4]. The reactions were carried out in boiling anhydrous methyl alcohol, and long-chain aromatic Schiff bases **IIIa**–**IIIv** and **IVa**–**IVm** were isolated in 87–94% yield (Scheme 1). The products were sufficiently pure (they contained no impurities of initial compounds), and no additional purification was necessary.

Compounds **III** and **IV** are colorless or slightly colored low-melting crystalline substances. Their structure was confirmed by the data of elemental analysis, cryoscopic determination of the molecular weight, and IR, UV, and ^{1}H NMR spectra. The azomethine proton (HC=N) resonated in the ^{1}H NMR spectra of **III** and **IV** as a singlet at δ 8.16–8.25 ppm, which is typical of *E* configuration about the C=N bond [5].

Scheme 1.



III, R = H, R′ = Me (**a**); R = MeO, R′ = H (**b**), Me (**c**), MeC(O) (**d**), EtC(O) (**e**), PrC(O) (**f**), $Me_2CHC(O)$ (**g**), $Me(CH_2)_6C(O)$ (**h**), $Me(CH_2)_8C(O)$ (**i**), $Me(CH_2)_{16}C(O)$ (**j**), $H_2C{=}C(Me)C(O)$ (**k**), $PhCH_2C(O)$ (**l**), $PhCH(Me)CH_2C(O)$ (**m**), PhC(O) (**n**), 2,4-$Cl_2C_6H_3C(O)$ (**o**), 4-$BrC_6H_4C(O)$ (**p**), 3-$O_2NC_6H_4C(O)$ (**q**), MeOC(O) (**r**), EtOC(O) (**s**), *o*-$C_2B_{10}H_{11}C(O)$ (**t**), *m*-$C_2B_{10}H_{11}C(O)$ (**u**); R = MeO (**v**); **IV**, R = EtO, R′ = H (**a**), Me (**b**), MeC(O) (**c**), EtC(O) (**d**), PrC(O) (**e**), $Me_2CHC(O)$ (**f**), $Me_2CHCH_2C(O)$ (**g**), 4-Me-$C_6H_4C(O)$ (**h**), MeOC(O) (**i**), EtOC(O) (**j**), *o*-$C_2B_{10}H_{11}C(O)$ (**k**), *m*-$C_2B_{10}H_{11}C(O)$ (**l**); R = EtO (**m**).

EXPERIMENTAL

The IR spectra were recorded in KBr on a Nicolet Protégé-460 spectrometer with Fourier transform. The UV spectra were measured on a Specord UV-Vis spectrophotometer from 1×10^{-4} M solutions in methanol. The ^{1}H NMR spectra were obtained on a Tesla BS-587A instrument operating at 100 MHz from 5% solutions in chloroform-*d* using tetramethylsilane as internal reference. The elemental compositions were determined with an accuracy of ±0.1% on an Elementar Vario EL-III C,H,N,O,S analyzer. The molecular weights were determined by cryoscopy in benzene.

Initial alkoxy- and acyloxy-substituted benzaldehydes **I** were synthesized according to the procedures described in [6–11]; commercial cetylamine (**II**) of analytical grade had a purity of 99%, mp 45–46°C.

Schiff bases IIIa–IIIu and IVa–IVl (*general procedure***).** A solution of 5 mmol of the corresponding aldehyde **I** and 5 mmol of cetylamine (**II**) in 30 ml of anhydrous methanol was heated for 20 min under reflux. The hot solution was filtered through a folded filter paper, the filtrate was cooled and left to stand for 10–15 h at 5°C, and the precipitate was filtered off through a glass filter, washed with a small amount of methanol, and dried in air.

Schiff bases IIIv and IVm (*general procedure***).** A solution of 5 mmol bis(4-formyl-2-methoxyphenyl) succinate or bis(2-ethoxy-4-formylphenyl) succinate and 10 mmol of cetylamine (**II**) in 30 ml of anhydrous methanol was heated for 20 min under reflux. The hot solution was filtered through a folded filter paper, the filtrate was cooled and left to stand for 10–15 h at 5°C, and the precipitate was filtered off through a glass filter, washed with a small amount of methanol, and dried in air.

(*E*)-*N*-(4-Methoxybenzylidene)hexadecan-1-amine (IIIa). Yield 89%, mp 30–31°C. IR spectrum, ν, cm^{-1}: 3075, 3040, 3004 (C–H$_{arom}$); 2955, 2919, 2850 (C–H$_{aliph}$); 1646 (C=N); 1606, 1579, 1512 (C=C$_{arom}$); 1470 (CH$_2$); 1305, 1255, 1164, 1029 (C–O); 860, 832, 820, 770, 722 (δC–H$_{arom}$). UV spectrum, λ_{max}, nm (ε): 209 (13000), 221 (12000), 254 (9000). ^{1}H NMR spectrum, δ, ppm: 0.91 t (3H, Me), 1.10–2.05 m (28H, CH$_2$), 3.55 t (2H, CH$_2$N), 3.87 s (3H, MeO), 6.90–7.90 m (4H, H$_{arom}$), 8.17 s (1H, CH=N). Found, %: C 80.47; H 11.62; N 3.74. *M* 350.1. $C_{24}H_{41}NO$. Calculated, %: C 80.16; H 11.49; N 3.90. *M* 359.6.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenol (IIIb). Yield 88%, mp 46–47°C. IR spectrum, ν, cm^{-1}: 3425 (OH); 3070, 3060, 2998 (C–H$_{arom}$); 2954, 2919, 2850 (C–H$_{aliph}$); 1646 (C=N); 1590, 1516, 1430 (C=C$_{arom}$); 1468 (CH$_2$); 1285, 1230, 1029, 1029 (C–O); 870, 824, 780, 740, 721 (δC–H$_{arom}$). UV spectrum, λ_{max}, nm (ε): 208 (12000), 225 (9000), 267 (10000), 303 (7000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (28H, CH$_2$), 3.64 t (2H, CH$_2$N), 3.94 s (3H, MeO), 6.60 br.s (1H, OH), 6.98–7.50 m (3H, H$_{arom}$), 8.16 s (1H, CH=N). Found, %: C 77.04; H 11.14; N 3.48. *M* 362.8. $C_{24}H_{41}NO_2$. Calculated, %: C 76.75; H 11.00; N 3.73. *M* 375.6.

(*E*)-*N*-(3,4-Dimethoxybenzylidene)hexadecan-1-amine (IIIc). Yield 90%, mp 48–49°C. IR spectrum, ν, cm^{-1}: 3080, 3004 (C–H$_{arom}$); 2955, 2916, 2850 (C–H$_{aliph}$); 1641 (C=N); 1602, 1585, 1514, 1419 (C=C$_{arom}$); 1471 (CH$_2$); 1265, 1239, 1163, 1137, 1022 (CO); 872, 811, 740, 715 (δC–H$_{arom}$). UV spectrum, λ_{max}, nm (ε): 207 (12000), 226 (11000), 268 (11000), 305 (7000). ^{1}H NMR spectrum, δ, ppm: 0.91 t (3H, Me), 1.10–2.05 m (28H, CH$_2$), 3.64 t (2H, CH$_2$N), 3.92 s (3H, 3-MeO), 3.95 s (3H, 4-MeO), 6.90–7.45 m (3H, H$_{arom}$), 8.17 s (1H, CH=N). Found, %: C 77.29; H 11.15; N 3.26. *M* 381.3. $C_{25}H_{43}NO_2$. Calculated, %: C 77.07; H 11.12; N 3.59. *M* 389.6.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl acetate (IIId). Yield 94%, mp 47–48°C. IR spectrum, ν, cm^{-1}: 3068, 3013 (C–H$_{arom}$); 2953, 2915, 2849 (C–H$_{aliph}$); 1765 (C=O); 1644 (C=N); 1601, 1598, 1514, 1374 (C=C$_{arom}$); 1472 (CH$_2$); 1289, 1268, 1222, 1164, 1112, 1033 (C–O); 860, 840, 785, 717 (δC–H$_{arom}$). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (13000), 254 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (28H, CH$_2$), 2.32 s (3H, Me), 3.64 t (2H, CH$_2$N), 3.89 s (3H, MeO), 7.08–7.48 m (3H, H$_{arom}$), 8.22 s (1H, CH=N). Found, %: C 74.97; H 10.44; N 3.01. *M* 408.6. $C_{26}H_{43}NO_3$. Calculated, %: C 74.78; H 10.38; N 3.35. *M* 417.6.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl propanoate (IIIe). Yield 92%, mp 53–54°C. IR spectrum, ν, cm^{-1}: 3070, 3020 (C–H$_{arom}$); 2956, 2915, 2849 (C–H$_{aliph}$); 1765 (C=O); 1645 (C=N); 1594, 1514, 1417, 1380 (C=C$_{arom}$); 1470 (CH$_2$); 1290, 1270, 1209, 1196, 1152, 1111, 1076, 1034 (C–O); 888, 860, 830, 804, 790, 719 (δC–H$_{arom}$). UV spectrum, λ_{max}, nm (ε): 208 (14000), 220 (13000), 254 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m [31H, CH$_3$, CH$_2$), 2.54 q (2H, CH$_2$), 3.64 t (2H, CH$_2$N), 3.89 s (3H, MeO), 7.08–7.49 m (3H, H$_{arom}$), 8.22 s (1H, CH=N). Found, %: C 75.61; H 10.58;

N 2.98. *M* 419.5. $C_{27}H_{45}NO_3$. Calculated, %: C 75.13; H 10.51; N 3.24. *M* 431.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl butanoate (IIIf). Yield 91%, mp 36–37°C. IR spectrum, ν, cm^{-1}: 3070, 3010 (C–H_{arom}); 2956, 2915, 2849 (C–H_{aliph}); 1763 (C=O); 1644 (C=N); 1596, 1514, 1416, 1385 (C=C_{arom}); 1472 (CH_2); 1290, 1268, 1207, 1150, 1032 (C–O); 872, 840, 785, 754, 716 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (13000), 220 (13000), 254 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.91 t (3H, Me), 1.05–2.08 m (33H, CH_3, CH_2), 2.55 t (2H, CH_2), 3.64 t (2H, CH_2N), 3.88 s (3H, MeO), 7.04–7.52 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 75.92; H 10.76; N 2.81. *M* 436.2. $C_{28}H_{47}NO_3$. Calculated, %: C 75.46; H 10.63; N 3.14. *M* 445.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 2-methylpropanoate (IIIg). Yield 90%, mp 30–31°C. IR spectrum, ν, cm^{-1}: 3080, 3012 (C–H_{arom}); 2970, 2920, 2850 (C–H_{aliph}); 1764 (C=O); 1647 (C=N); 1600, 1510, 1418, 1385 (C=C_{arom}); 1468 (CH_2); 1270, 1200, 1180, 1160, 1124, 1035 (C–O); 866, 821, 780, 752, 721 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (13000), 220 (13000), 254 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.24–1.94 m (34H, Me_2C, CH_2), 2.83 m (1H, CH), 3.60 t (2H, CH_2N), 3.88 s (3H, MeO), 7.04–7.50 m (3H, H_{arom}), 8.21 s (1H, CH=N). Found, %: C 75.99; H 10.70; N 2.84. *M* 432.6. $C_{28}H_{47}NO_3$. Calculated, %: C 75.46; H 10.63; N 3.14. *M* 445.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl octanoate (IIIh). Yield 93%, mp 33–34°C. IR spectrum, ν, cm^{-1}: 3080, 3011 (C–H_{arom}); 2955, 2916, 2850 (C–H_{aliph}); 1762 (C=O); 1647 (C=N); 1598, 1514, 1417, 1380 (C=C_{arom}); 1472 (CH_2); 1290, 1200, 1190, 1159, 1112, 1033 (C–O); 865, 830, 780, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (13000), 253 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (6H, Me), 1.12–1.90 m (38H, CH_2), 2.62 t (2H, CH_2), 3.64 t (2H, CH_2N), 3.89 s (3H, MeO), 7.07–7.50 m (3H, H_{arom}), 8.21 s (1H, CH=N). Found, %: C 76.90; H 11.14; N 2.50. *M* 491.0. $C_{32}H_{55}NO_3$. Calculated, %: C 76.60; H 11.05; N 2.79. *M* 501.8.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl decanoate (IIIi). Yield 92%, mp 45–46°C. IR spectrum, ν, cm^{-1}: 3075, 3011 (C–H_{arom}); 2955, 2916, 2850 (C–H_{aliph}); 1761 (C=O); 1641 (C=N); 1595, 1540, 1514, 1419, 1379 (C=C_{arom}); 1472 (CH_2); 1290, 1270, 1204, 1195, 1158, 1113, 1032 (C–O); 860, 830, 780, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (12000), 220 (13000), 254 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (6H, Me), 1.10–1.94 m (42H, (CH_2), 2.61 t (2H, CH_2), 3.64 t (2H, CH_2N), 3.89 s (3H, MeO), 7.08–7.50 m (3H, H_{arom}), 8.21 s (1H, CH=N). Found, %: C 77.38; H 11.37; N 2.88. *M* 506.5. $C_{34}H_{59}NO_3$. Calculated, %: C 77.07; H 11.22; N 2.64. *M* 529.8.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl octadecanoate (IIIj). Yield 89%, mp 42–43°C. IR spectrum, ν, cm^{-1}: 3080, 3011 (C–H_{arom}); 2955, 2917, 2850 (C–H_{aliph}); 1751 (C=O); 1647 (C=N); 1600, 1510, 1516, 1380 (C=C_{arom}); 1471 (CH_2); 1294, 1274, 1195, 1160, 1143, 1112, 1032 (C–O); 870, 830, 780, 718 (C–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (12000), 220 (12000), 254 (8000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (6H, Me), 1.10–1.96 m (58H, CH_2), 2.62 t (2H, CH_2), 3.65 t (2H, CH_2N), 3.89 s (3H, MeO), 7.08–7.54 m (3H, H_{arom}), 8.20 s (1H, CH=N). Found, %: C 78.93; H 11.96; N 1.80. *M* 622.3. $C_{42}H_{75}NO_3$. Calculated, %: C 78.57; H 11.77; N 2.18. *M* 642.1.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 2-methylprop-2-enoate (IIIk). Yield 88%, mp 36–37°C. IR spectrum, ν, cm^{-1}: 3075, 3012 (C–H_{arom}); 2960, 2915, 2850 (C–H_{aliph}); 1742 (C=O); 1645 (C=N); 1600, 1590, 1514, 1417, 1385 (C=C_{arom}); 1474 (CH_2); 1292, 1265, 1210, 1165, 1132 (CO); 875, 860, 825, 786, 716 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (16000), 220 (16000), 255 (11000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.90 t (3H, Me), 1.15–1.90 m (28H, CH_2), 2.00 s (3H, Me), 3.63 t (2H, CH_2N), 3.88 s (3H, MeO), 5.75 m (1H, =CH), 6.40 m (1H, =CH), 7.10–7.50 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 76.13; H 10.41; N 3.00. *M* 425.4. $C_{28}H_{45}NO_3$. Calculated, %: C 75.80; H 10.22; N 3.16. *M* 443.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl phenylacetate (IIIl). Yield 89%, mp 33–34°C. IR spectrum, ν, cm^{-1}: 3090, 3070, 3034, 3006 (C–H_{arom}); 2954, 2918, 2850 (C–H_{aliph}); 1764 (C=O); 1634 (C=N); 1600, 1557, 1510, 1496, 1432, 1418, 1380 (C=C_{arom}); 1468, 1455 (CH_2); 1278, 1235, 1200, 1160, 1120, 1074, 1030 (C–O); 878, 840, 830, 750, 718, 695 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (20000), 220 (14000), 256 (10000), 302 (5000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.17–1.90 m (28H, CH_2), 3.65 t (2H, CH_2N), 3.82 s (2H, CH_2), 3.90 s (3H, MeO), 7.00–7.54 m (8H, H_{arom}), 8.22 s (1H, CH=N).

Found, %: C 78.08; H 9.76; N 2.58. *M* 472.0. $C_{32}H_{47}NO_3$. Calculated, %: C 77.85; H 9.59; N 2.84. *M* 493.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 2-phenylbutanoate (IIIm). Yield 91%, mp 35–36°C. IR spectrum, ν, cm^{-1}: 3090, 3080, 3070, 3040, 3025, 3003 (C–H_{arom}); 2956, 2918, 2850 (C–H_{aliph}); 1758 (C=O); 1646 (C=N); 1600, 1505, 1416, 1383 (C=C_{arom}); 1468, 1454 (CH_2); 1270, 1240, 1198, 1152, 1122, 1080, 1038 (C–O); 870, 840, 765, 748, 719, 700 (C–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (20000), 220 (14000), 255 (9000), 302 (5000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.18–1.90 m (28H, CH_2), 1.42 d (3H, Me), 2.88 m (2H, CH_2), 3.42 m (1H, CH), 3.66 t (2H, CH_2N), 3.90 s (3H, MeO), 7.04–7.54 m (8H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 78.85; H 9.95; N 2.44. *M* 508.5. $C_{34}H_{51}NO_3$. Calculated, %: C 78.27; H 9.85; N 2.68. *M* 521.8.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl benzoate (IIIn). Yield 90%, mp 34–35°C. IR spectrum, ν, cm^{-1}: 3078, 3004 (C–H_{arom}); 2954, 2918, 2850 (C–H_{aliph}); 1756 (C=O); 1647 (C=N); 1600, 1591, 1510, 1437, 1417, 1380 (C=C_{arom}); 1469 (CH_2); 1290, 1273, 1243, 1198, 1160, 1112, 1094, 1032 (CO); 870, 815, 785, 744, 720, 706, 680 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (33000), 220 (20000), 254 (16000), 296 (6000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.15–1.90 m (28H, CH_2), 3.64 t (2H, CH_2N), 3.95 s (3H, MeO), 7.10–8.20 m (8H, H_{arom}), 8.25 s (1H, CH=N). Found, %: C 78.01; H 9.72; N 2.53. *M* 465.1. $C_{31}H_{45}NO_3$. Calculated, %: C 77.62; H 9.45; N 2.92. *M* 479.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 2,4-dichlorobenzoate (IIIo). Yield 94%, mp 40–41°C. IR spectrum, ν, cm^{-1}: 3100, 3085, 3004 (C–H_{arom}); 2960, 2918, 2850 (C–H_{aliph}); 1755 (C=O); 1648 (C=N); 1600, 1586, 1558, 1508, 1417, 1376 (C=C_{arom}); 1468 (CH_2); 1275, 1238, 1198, 1160, 1148, 1112, 1087, 1032 (C–O); 870, 830, 804, 785, 760, 720, 680 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (40000), 223 (30000), 254 (17000), 300 (6000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.18–2.00 m (28H, CH_2), 3.65 t (2H, CH_2N), 3.90 s (3H, MeO), 7.10–8.50 m (6H, H_{arom}), 8.25 s (1H, CH=N). Found, %: C 68.04; H 8.06; Cl 12.50; N 2.19. *M* 426.8. $C_{31}H_{43}Cl_2NO_3$. Calculated, %: C 67.87; H 7.90; Cl 12.93; N 2.55. *M* 548.6.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 4-bromobenzoate (IIIp). Yield 93%, mp 44–45°C. IR spectrum, ν, cm^{-1}: 3100, 3080, 3005 (C–H_{arom}); 2955, 2918, 2850 (C–H_{aliph}); 1744 (C=O); 1648 (C=N); 1630, 1592, 1536, 1506, 1484, 1468, 1416, 1398, 1378 (C=C_{arom}); 1468 (CH_2); 1274, 1260, 1205, 1160, 1120, 1072, 1034, 1012 (C–O); 875, 848, 814, 748, 720, 684 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (38000), 221 (28000), 256 (24000), 300 (7000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.20–1.98 m (28H, CH_2), 3.65 t (2H, CH_2N), 3.89 s (3H, MeO), 7.20–8.25 m (7H, H_{arom}), 8.25 s (1H, CH=N). Found, %: C 66.89; H 8.08; Br 13.87; N 2.14. *M* 542.3. $C_{31}H_{44}BrNO_3$. Calculated, %: C 66.66; H 7.94; Br 14.30; N 2.51. *M* 558.6.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 3-nitrobenzoate (IIIq). Yield 90%, mp 55–56°C. IR spectrum, ν, cm^{-1}: 3094, 3080, 3060, 3002 (C–H_{arom}); 2954, 2920, 2850 (C–H_{aliph}); 1750 (C=O); 1647 (C=N); 1634, 1620, 1600, 1505, 1417, 1380 (C=C_{arom}); 1536, 1348 (NO_2); 1467 (CH_2); 1295, 1275, 1256, 1197, 1160, 1122, 1060, 1032 (C–O); 870, 830, 815, 765, 750, 716 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 204 (36000), 220 (37000), 258 (18000), 302 (7000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.16–1.96 m (28H, CH_2), 3.65 t (2H, CH_2N), 3.91 s (3H, MeO), 7.18–8.44 m (7H, H_{arom}), 8.25 s (1H, CH=N). Found, %: C 71.28; H 8.66; N 5.11. *M* 513.2. $C_{31}H_{44}N_2O_5$. Calculated, %: C 70.96; H 8.45; N 5.34. *M* 524.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl methyl carbonate (IIIr). Yield 91%, mp 44–45°C. IR spectrum, ν, cm^{-1}: 3068, 3010 (C–H_{arom}); 2955, 2915, 2850 (C–H_{aliph}); 1764 (C=O); 1644 (C=N); 1600, 1598, 1515, 1374 (C=C_{arom}); 1472 (CH_2); 1290, 1270, 1225, 1165, 1112, 1032 (C–O); 860, 840, 785, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (12000), 220 (13000), 255 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (28H, CH_2), 3.64 t (2H, CH_2N), 3.89 (3H, 3-MeO), 3.96 s (3H, 4-MeOCO), 7.06–7.48 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 72.38; H 10.12; N 2.89. *M* 419.7. $C_{26}H_{43}NO_4$. Calculated, %: C 72.02; H 9.99; N 3.23. *M* 433.6.

Ethyl [(*E*)-hexadecyliminomethyl]-2-methoxyphenyl carbonate (IIIs). Yield 90%, mp 43–44°C. IR spectrum, ν, cm^{-1}: 3070, 3010 (C–H_{arom}); 2956, 2915, 2850 (C–H_{aliph}); 1765 (C=O); 1644 (C=N); 1601, 1598, 1515, 1374 (C=C_{arom}); 1472 (CH_2); 1290, 1272, 1225, 1165, 1112, 1032 (C–O); 860, 840, 785, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (13000), 255 (9000), 300 (400). ^{1}H NMR spec-

trum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (31H, Me, CH_2), 3.64 t (2H, CH_2N), 3.89 (3H, MeO), 4.18 q (2H, CH_2), 7.08–7.48 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 72.56; H 10.31; N 2.80. *M* 432.6. $C_{27}H_{45}NO_4$. Calculated, %: C 72.44; H 10.13; N 3.13. *M* 447.7.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 1,2-dicarba-*closo*-dodecaborane-1-carboxylate (IIIt). Yield 88%, mp 40–41°C. IR spectrum, ν, cm^{-1}: 3095, 3066, 3020 (C–H_{arom}, C–$H_{carb.}$); 2956, 2915, 2850 (C–H_{aliph}); 2610, 2580 (B–H); 1770 (C=O); 1646 (C=N); 1594, 1515, 1417, 1380 (C=C_{arom}); 1470 (CH_2); 1290, 1270, 1210, 1196, 1152, 1112, 1076, 1034 (C–O); 888, 860, 830, 804, 790, 719 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 206 (14000), 220 (13000), 254 (10000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.06–2.00 m (28H, CH_2), 3.64 t (2H, CH_2N), 3.89 s (3H, MeO), 4.10 br.s (1H, CH_{carb}), 7.02–7.58 m (3H, H_{arom}), 8.23 s (1H, CH=N). Found, %: C 59.90; H 9.65; B 19.28; N 2.14. *M* 524.9. $C_{27}H_{51}B_{10}NO_3$. Calculated, %: C 59.41; H 9.42; B 19.81; N 2.57. *M* 545.8.

4-[(*E*)-Hexadecyliminomethyl]-2-methoxyphenyl 1,3-dicarba-*closo*-dodecaborane-1-carboxylate (IIIu). Yield 89%, mp 39–40°C. IR spectrum, ν, cm^{-1}: 3095, 3062, 3020 (C–H_{arom}, C–$H_{carb.}$); 2956, 2914, 2850 (C–H_{aliph}); 2605 (B–H); 1750 (C=O); 1646 (C=N); 1594, 1514, 1417, 1380 (C=C_{arom}); 1471 (CH_2); 1290, 1270, 1212, 1196, 1152, 1113, 1076, 1033 (C–O); 886, 860, 830, 804, 790, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (14000), 220 (13000), 254 (10000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.06–2.00 m (28H, CH_2), 3.04 br.s (1H, CH_{carb}), 3.64 t (2H, CH_2N), 3.89 s (3H, MeO), 7.02–7.56 m (3H, H_{arom}), 8.23 s (1H, CH=N). Found, %: C 59.62; H 9.51; B 19.60; N 2.41. *M* 532.6. $C_{27}H_{51}B_{10}NO_3$. Calculated, %: C 59.41; H 9.42; B 19.81; N 2.57. *M* 545.8.

Bis{4-[(*E*)-hexadecyliminomethyl]-2-methoxyphenyl} succinate (IIIv). Yield 93%, mp 67–68°C. IR spectrum, ν, cm^{-1}: 3090, 3070, 3006 (C–H_{arom}); 2956, 2918, 2850 (C–H_{aliph}); 1760 (C=O); 1640 (C=N); 1600, 1540, 1512, 1420, 1378 (C=C_{arom}); 1468 (CH_2); 1290, 1272, 1205, 1150, 1124, 1028 (C–O); 870, 830, 785, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (26000), 220 (25000), 255 (17000), 300 (9000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (6H, Me), 1.10–2.00 m (56H, CH_2), 3.04 s (4H, $COCH_2$), 3.64 t (4H, CH_2N), 3.89 s (6H, MeO), 7.08–7.50 m (6H, H_{arom}), 8.22 s (2H, CH=N). Found, %: C 75.13; H 10.14; N 3.08. *M* 814.0. $C_{52}H_{84}N_2O_6$. Calculated, %: C 74.96; H 10.16; N 3.36. *M* 833.2.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenol (IVa). Yield 87%, mp 48–49°C. IR spectrum, ν, cm^{-1}: 3424 (OH); 3070, 3035, 3000 (C–H_{arom}); 2960, 2918, 2850 (C–H_{aliph}); 1643 (C=N); 1588, 1514, 1428, 1355 (C=C_{arom}); 1472 (CH_2); 1284, 1235, 1194, 1170, 1128, 1044 (C–O); 870, 824, 760, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (10000), 224 (10000), 268 (10000), 302 (6000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (31H, Me, CH_2), 3.64 t (2H, CH_2N), 4.10 q (2H, CH_2O), 6.70 br.s (1H, OH), 6.98–7.48 m (3H, H_{arom}), 8.16 s (1H, CH=N). Found, %: C 77.32; H 11.25; N 3.26. *M* 368.4. $C_{25}H_{43}NO_2$. Calculated, %: C 77.07; H 11.12; N 3.59. *M* 389.6.

(*E*)-*N*-(3-Ethoxy-4-methoxybenzylidene)hexadecan-1-amine (IVb). Yield 92%, mp 37–38°C. IR spectrum, ν, cm^{-1}: 3080, 3004 (C–H_{arom}); 2954, 2916, 2850 (C–H_{aliph}); 1641 (C=N); 1602, 1585, 1514, 1420 (C=C_{arom}); 1471 (CH_2); 1265, 1240, 1163, 1137, 1022 (C–O); 872, 811, 740, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (12000), 225 (11000), 268 (11000), 305 (7000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.05 m (31H, Me, CH_2), 3.64 t (2H, CH_2N), 3.94 s (3H, MeO), 4.26 q (2H, CH_2O), 6.90–7.44 m (3H, H_{arom}), 8.17 s (1H, CH=N). Found, %: C 77.52; H 11.35; N 3.20. *M* 390.8. $C_{26}H_{45}NO_2$. Calculated, %: C 77.37; H 11.24; N 3.47. *M* 403.6.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl acetate (IVc). Yield 92%, mp 45–46°C. IR spectrum, ν, cm^{-1}: 3070, 3016 (C–H_{arom}); 2958, 2918, 2850 (C–H_{aliph}); 1766 (C=O); 1645 (C=N); 1590, 1512, 1434, 1370 (C=C_{arom}); 1468 (CH_2); 1286, 1240, 1220, 1194, 1170, 1124, 1040 (C–O); 865, 830, 760, 740, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (12000), 220 (13000), 255 (9000), 301 (4000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (31H, Me, CH_2), 2.32 s (3H, Me), 3.63 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.08–7.44 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 75.47; H 10.62; N 2.90. *M* 421.4. $C_{27}H_{45}NO_3$. Calculated, %: C 75.13; H 10.51; N 3.24. *M* 431.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl propanoate (IVd). Yield 90%, mp 48–49°C. IR spectrum, ν, cm^{-1}: 3070, 3056, 3015 (C–H_{arom}); 2958, 2918, 2850 (C–H_{aliph}); 1766 (C=O); 1646 (C=N); 1600, 1594, 1512, 1430, 1380, 1354 (C=C_{arom}); 1468 (CH_2); 1284, 1272, 1196, 1164, 1146, 1120, 1080, 1040 (C–O); 890,

840, 802, 760, 740, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (14000), 254 (9000), 300 (4000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (34H, Me, CH_2), 2.55 q (2H, CH_2), 3.62 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.06–7.50 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 75.67; H 10.74; N 2.84. *M* 432.9. $C_{28}H_{47}NO_3$. Calculated, %: C 75.46; H 10.63; N 3.14. *M* 445.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl butanoate (IVe). Yield 89%, mp 38–39°C. IR spectrum, ν, cm^{-1}: 3070, 3012 (C–H_{arom}); 2960, 2915, 2850 (C–H_{aliph}); 1767 (C=O); 1646 (C=N); 1600, 1590, 1513, 1431, 1412, 1380 (C=C_{arom}); 1470 (CH_2); 1290, 1266, 1154, 1118, 1042 (C–O); 870, 840, 785, 754, 715 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (12000), 220 (13000), 254 (9000), 300 (4000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.06–2.08 m (36H, Me, CH_2), 2.54 q (2H, CH_2), 3.63 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.06–7.54 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 75.95; H 10.86; N 2.69. *M* 444.3. $C_{29}H_{49}NO_3$. Calculated, %: C 75.77; H 10.74; N 3.05. *M* 459.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl 2-methylpropanoate (IVf). Yield 90%, mp 35–36°C. IR spectrum, ν, cm^{-1}: 3070, 3010 (C–H_{arom}); 2960, 2918, 2850 (C–H_{aliph}); 1764 (C=O); 1647 (C=N); 1600, 1590, 1510, 1432, 1395, 1380 (C=C_{arom}); 1469 (CH_2); 1290, 1270, 1205, 1154, 1182, 1167, 1122, 1096, 1044 (C–O); 865, 820, 790, 770, 740, 721 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (13000), 255 (9000), 300 (4000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.14–1.90 m (37H, Me, Me_2C, CH_2), 2.80 m (1H, CH), 3.62 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.02–7.50 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 75.98; H 10.89; N 2.87. *M* 448.7. $C_{29}H_{49}NO_3$. Calculated, %: C 75.77; H 10.74; N 3.05. *M* 459.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl 3-methylbutanoate (IVg). Yield 93%, mp 32–33°C. IR spectrum, ν, cm^{-1}: 3070, 3040, 3016 (C–H_{arom}); 2958, 2918, 2851 (C–H_{aliph}); 1764 (C–H_{aliph}); 1648 (C=N); 1600, 1595, 1510, 1431, 1395, 1380 (C=C_{arom}); 1468 (CH_2); 1289, 1272, 1195, 1164, 1120, 1043 (C–O); 870, 825, 795, 760, 740, 721 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (12000), 220 (13000), 254 (9000), 300 (4000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.08 d (6H, Me_2C), 1.12–2.82 m (34H, Me, CH, CH_2), 3.62 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.02–7.46 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 76.27; H 10.92; N 2.60. *M* 458.2. $C_{30}H_{51}NO_3$. Calculated, %: C 76.06; H 10.85; N 2.96. *M* 473.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl 4-methylbenzoate (IVh). Yield 94%, mp 32–33°C. IR spectrum, ν, cm^{-1}: 3090, 3080, 3040, 3005 (C–H_{arom}); 2958, 2918, 2850 (C–H_{aliph}); 1741 (C=O); 1647 (C=N); 1612, 1602, 1510, 1431, 1394, 1380 (C=C_{arom}); 1468 (CH_2); 1272, 1201, 1178, 1166, 1119, 1068, 1042, 1020 (C–O); 874, 840, 806, 788, 764, 746, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (35000), 221 (20000), 254 (24000), 300 (6000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.16–1.92 m (31H, Me, CH_2), 2.45 s (3H, Me), 3.63 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.08–8.14 m (7H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 78.25; H 7.74; N 2.38. *M* 500.1. $C_{33}H_{49}NO_3$. Calculated, %: C 78.06; H 9.73; N 2.76. *M* 507.8.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl methyl carbonate (IVi). Yield 90%, mp 40–41°C. IR spectrum, ν, cm^{-1}: 3070, 3010 (C–H_{arom}); 2955, 2915, 2850 (C–H_{aliph}); 1764 (C=O); 1644 (C=N); 1600, 1598, 1515, 1374 (C=C_{arom}); 1472 (CH_2); 1290, 1271, 1225, 1165, 1112, 1032 (C–O); 860, 840, 785, 719 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (13000), 220 (13000), 255 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (31H, Me, CH_2), 3.64 t (2H, CH_2N), 3.95 s (3H, MeO), 4.12 q (2H, CH_2), 7.08–7.50 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 72.64; H 10.16; N 2.83. *M* 436.5. $C_{27}H_{45}NO_4$. Calculated, %: C 72.44; H 10.13; N 3.13. *M* 447.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl ethyl carbonate (IVj). Yield 91%, mp 44–45°C. IR spectrum, ν, cm^{-1}: 3070, 3010 (C–H_{arom}); 2956, 2915, 2850 (C–H_{aliph}); 1765 (C=O); 1644 (C=N); 1600, 1597, 1515, 1374 (C=C_{arom}); 1471 (CH_2); 1290, 1271, 1224, 1165, 1112, 1032 (C–O); 860, 840, 784, 719 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (12000), 220 (13000), 255 (9000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.10–2.00 m (34H, Me, CH_2), 3.64 t (2H, CH_2N), 3.90–4.20 m (4H, CH_2), 7.08–7.52 m (3H, H_{arom}), 8.22 s (1H, CH=N). Found, %: C 73.12; H 10.38; N 2.74. *M* 449.4. $C_{28}H_{47}NO_4$. Calculated, %: C 72.84; H 10.26; N 3.03. *M* 461.7.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl 1,2-dicarba-*closo*-dodecaborane-1-carboxylate (IVk). Yield 87%, mp 30–31°C. IR spectrum, ν, cm^{-1}: 3095, 3067, 3020 (C–H_{arom}, C–H_{carb}); 2954, 2915, 2850 (C–H_{aliph}); 2611, 2580 (B–H); 1770 (C=O); 1646 (C=N); 1594, 1514, 1417, 1380 (C=C_{arom}); 1471 (CH_2); 1290, 1270, 1210, 1196, 1151, 1112, 1076, 1032 (C–O); 888, 860, 831, 804, 790, 718 (δC–H_{arom}). UV

spectrum, λ_{max}, nm (ε): 206 (14000), 220 (13000), 254 (10000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.06–2.00 m (31H, Me, CH_2), 3.64 t (2H, CH_2N), 4.08 br.s (1H, CH_{carb}), 4.12 q (2H, CH_2O), 7.02–7.54 m (3H, H_{arom}), 8.23 s (1H, CH=N). Found, %: C 60.31; H 9.87; B 19.10; N 2.18. *M* 542.7. $C_{28}H_{53}B_{10}NO_3$. Calculated, %: C 60.07; H 9.54; B 19.31; N 2.50. *M* 559.8.

2-Ethoxy-4-[(*E*)-hexadecyliminomethyl]phenyl 1,3-dicarba-*closo*-dodecaborane-1-carboxylate (IVl). Yield 89%, mp 30–31°C. IR spectrum, ν, cm^{-1}: 3095, 3066, 3020 (C–H_{arom}, C–H_{carb}); 2955, 2915, 2850 (C–H_{aliph}); 2605 (B–H); 1750 (C=O); 1646 (C=N); 1594, 1514, 1417, 1380 (C=C_{arom}); 1472 (CH_2); 1290, 1270, 1212, 1196, 1151, 1113, 1076, 1032 (C–O); 886, 860, 830, 805, 790, 718 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 205 (14000), 220 (13000), 255 (10000), 300 (400). ^{1}H NMR spectrum, δ, ppm: 0.92 t (3H, Me), 1.06–2.02 m (31H, Me, CH_2), 3.04 br.s (1H, CH_{carb}), 3.64 t (2H, CH_2N), 4.12 q (2H, CH_2O), 7.02–7.56 m (3H, H_{arom}), 8.23 s (1H, CH=N). Found, %: C 60.24; H 10.10; B 19.08; N 2.35. *M* 547.2. $C_{28}H_{53}B_{10}NO_3$. Calculated, %: C 60.07; H 9.54; B 19.31; N 2.50. *M* 559.8.

Bis{2-ethoxy-4-[(*E*)-hexadecyliminomethyl]-phenyl} succinate (IVm). Yield 91%, mp 60–61°C. IR spectrum, ν, cm^{-1}: 3070, 3058, 3010 (C–H_{arom}); 2955, 2918, 2850 (C–H_{aliph}); 1763 (C=O); 1646 (C=N); 1600, 1594, 1548, 1510, 1431, 1394, 1380 (C=C_{arom}); 1470 (CH_2); 1287, 1273, 1201, 1166, 1120, 1041 (C–O); 870, 834, 801, 760, 740, 721 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (25000), 220 (25000), 255 (19000), 300 (8000). ^{1}H NMR spectrum, δ, ppm: 0.92 t (6H, Me), 1.12–1.96 (62H, Me, CH_2), 3.03 s (4H, CH_2CO), 3.63 t (4H, CH_2N), 4.12 q (4H, CH_2O), 7.10–7.45 m (6H, H_{arom}), 8.22 s (2H, CH=N). Found, %: C 75.46; H 10.38; N 3.02. *M* 843.5. $C_{54}H_{88}N_2O_6$. Calculated, %: C 75.30; H 10.32; N 3.25. *M* 861.3.

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