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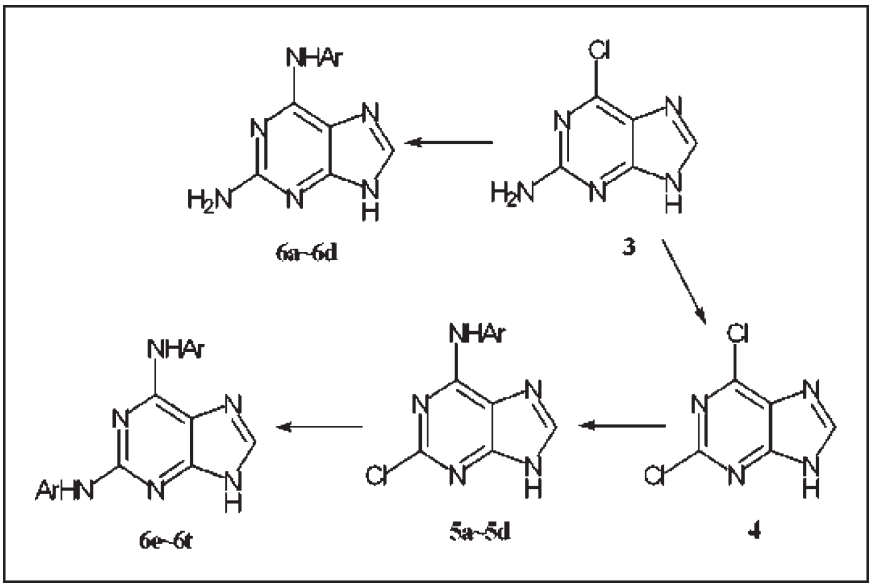

A series of novel 2, 6-diaromatic-aminopurines (6a–6t) have been synthesized from guanine and characterized fully. The effects of different catalysts on the N-alkylation of 2-position of purine ring were discussed.

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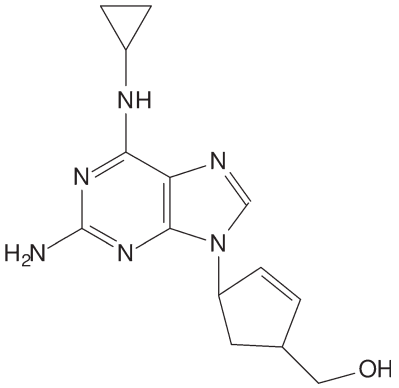
INTRODUCTION

Purine derivatives are often shown to possess a wide range of interesting pharmacological activities [1]. For example, the purine nucleus is the key structural feature of many types of biologically active compounds, such as CDK inhibitors [2], and Hsp 90 family inhibitors [3]. The results indicate that purine derivatives should combine with RNA of the virus cell when 2-position and 6-position in the purine ring are introduced with the ylamine in the form of *C—N* bond. They can inhibit the reproduction of the virus cell in the body, thus have the fine medicine activity [4]. For instance, abacavir (Scheme 1) is being clinical to cure for AIDS [5]. Consequently, purines have become a well-sought privileged class of compounds in drug discovery programs and a practical strategy for the construction of a library of purines that should aid both SAR studies and screenings for new leads.

In the literatures, most methods about the preparation of 2,6-diaminepuine derivatives involved a N-alkylation reaction [6]. Because the reaction activity of 6-position is higher than that of 2-position in the same purine ring, different aliphatic amines can be introduced into the purine ring selectively by controlling the reaction temperature [7]. However, aromatic amines are very difficult to be introduced due to their low activity of nucleophilic substitution, and reported scarcely. Meanwhile, to increase the reaction activity of 2-position, *N,N*-dimethylformamide (DMF) is often used as solvent [5,6].

From the purine structure, we can find that the main reason causes the activity of 2-position to decline is the existence of 6-ylamine which shares electrons with purine ring by p—π bond. But acids can occupy the electrons of *N* atom and destroy p—π bond, and will increase reaction activity of 2-position, so we used acids as catalysts in the reactions in present study. Furthermore, the reaction was carried out under microwave conditions, the corresponding reaction time is thus shortened and the yield is also improved greatly.

Scheme 1



RESULTS AND DISCUSSION

The synthetic pathways are shown in Scheme 2. Compounds **1–3** were synthesized according to the literature method [8], and compound **4** according to the literature method [9]. The title compounds **6a–6d** were obtained by the reaction of compound **3** with corresponding arylamine in DMF, and the title compounds **6e–6t** were obtained by the reaction of compounds **5a–5d** with corresponding arylamine in the presence of TFA(?) in butanol (BuOH). And compounds **5a–5d** were prepared by reaction between compound **4** and the corresponding arylamine in the presence of Et_3N in BuOH.

N-alkylation reaction plays an important role in the preparation of 2,6-diaminepurine from 2,6-dichloropuine. We concluded that protonation of 2,6-diaminepurine activate the chloro atom toward nucleophilic substitution reaction, so we carried out our experiment to synthesis **6a–6d** under acid conditions. However, 2,6-diaminepurine was failed to obtained from 2,6-dichloropurine, which was ascribe to the protonation reduction of amino groups of aromatic amines. Triethylamine could activate the aromatic amines toward nucleophilic substitution reactions, but the reaction needed 72 h and the color of the product was badly. The reaction was carried out quickly under microwave conditions and only 18 minutes was needed to obtain the desired products in about 80% yields. Many byproducts were formed when the compounds **6e–6t** were prepared under the base conditions, however, the desired products were

Scheme 2

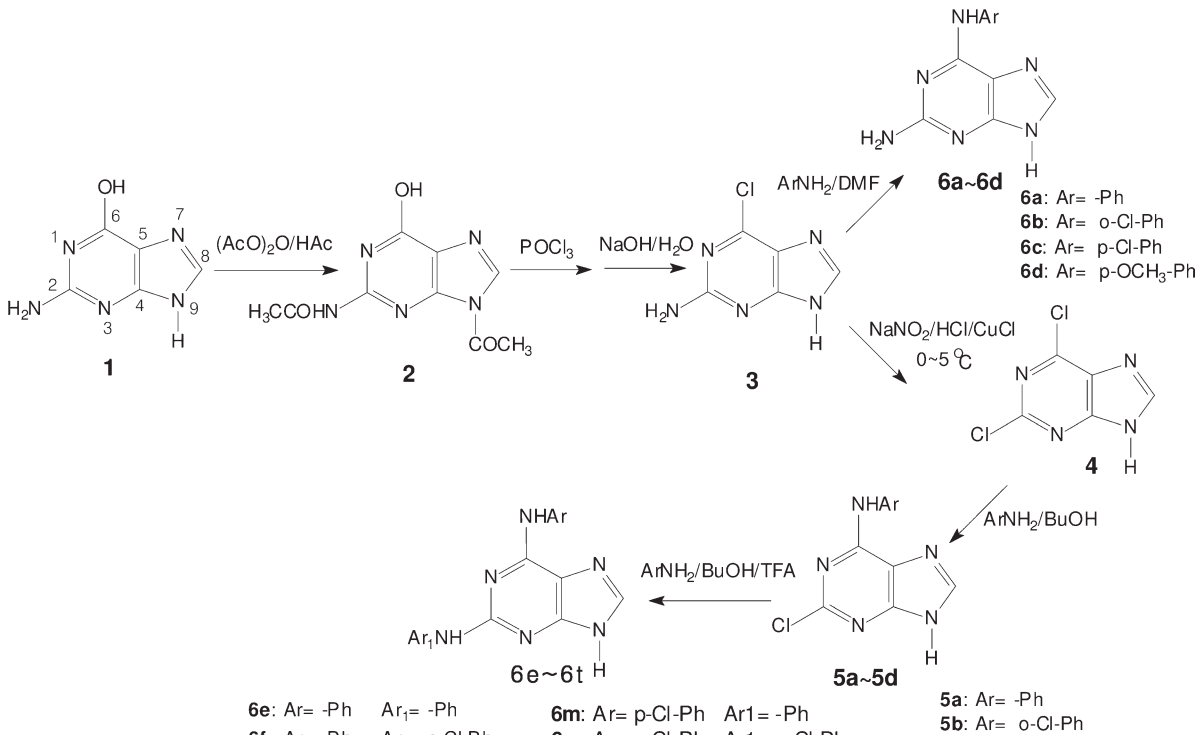


Table 1

Yield of products on different catalyst.

Compd.	HCl (%)	TFA (%)	$AlCl_3$ (%)	Compd.	HCl (%)	TFA (%)	$AlCl_3$ (%)
6e	35.9	55.2	54.7	**6m**	31.2	69.2	68.7
6f	29.4	49.9	49.1	**6n**	23.4	51.1	53.9
6g	36.8	49.1	50.7	**6o**	19.8	48.8	45.1
6h	41.4	62.3	67.4	**6p**	22.7	54.1	45.8
6i	33.9	49.8	56.8	**6q**	27.9	57.2	65.2
6j	21.0	50.6	45.9	**6r**	45.0	61.2	66.9
6k	37.7	54.2	51.7	**6s**	44.6	50.9	68.1
6l	30.6	44.7	46.1	**6t**	43.1	69.7	71.3

obtained with satisfied yields under the acid conditions. Different acids were used to prompt the reactions for the desired products with good to best yields, and the results are summarized in Table 1. It is obvious that TFA and aluminum chloride anhydrous are better than HCl as catalyst (Table 1).

In conclusion, a series of novel 2-substituted purine derivatives were synthesized under microwave conditions using acids as the catalysts, which provide a new way to access a large number of 2,6-diaminepurine derivatives.

EXPERIMENTAL

The melting points were determined on Yansco melting point apparatus and were uncorrected; ^{1}H NMR data were recorded on a Bruker-Avance DXP 400 MHz NMR spectrometer using Tertramethylsilane(TMS) as a internal standard and DMSO-d_6 as solvent; PE-2400 atom analytic apparatus; 6110 MS from Agilen company. MAS-II microwave assisted synthesis extract apparatus.

2-Chloro-6-arylaminopurine derivatives (5a–5d). To a three-necked flask, 2,6-dichloropurine (10 mmol, 1.9 g), BuOH (45 mL) and corresponding arylamine (50 mmol) were added, under nitrogen with 300W microwave at 70°C until the reaction was over. The solid was collected by filtration and recrystallized with MeOH to give desired product.

2-Amino-6-arylamino-purine derivatives (6a–6d). To a three-necked flask, 2-amino-6-chloropurine (10 mmol, 1.7 g), DMF (30 mL), corresponding amine (30 mL), triethylamine (5 mL) were added , under nitrogen, and then the reaction was carried out with 300W microwave at 90°C for 18 min. The mixture was cooled to the room temperature, filtered and recrystallized with methanol to yield the desired product.

2,6-Diarylaminopurine derivatives (6e–6t). To a three-necked flask, 2-chloro-6-arylaminopurine (10 mmol), normal butyl alcohol (30 mL), corresponding amine (25 mL) and acid (10 mmol) were added, under nitrogen, and then the reaction was carried out with 300W microwave at 110°C for 5 min. The mixture was cooled to the room temperature, filtered and recrystallized with DMF to yield the desired product.

Data of all the compounds

N^2,9-Diacetylguanine (2). White crystal; yield, 95.8%; m.p.: >250°C^{1}H NMR (DMSO, 400 MHz) δ: 2.16 (s, 3H, *C2*—$COCH_3$), 2.50 (s, 3H, *N9*—$COCH_3$), 8.10 (br, 2H, —NH+—CH), 11.56 (s, 1H, —OH); MS (EI) *m/z*: 234.10 (M-1); Anal. calcd for $C_9H_9N_5O_3$: C 45.96, H 3.86, N 29.78; found C 45.87, H 3.90, N 29.68.

2-Amino-6-chloropurine (3). Pale yellow solid: yield, 75.8%: m.p.: >250°C ^{1}H NMR (DMSO, 400MHz) δ: 6.75 (s, 3H, —NH_2+—NH), 8.01 (s, 1H, —CH); MS (EI) *m/z*: 169.13 (M-1); Anal. calcd for $C_5H_4N_5Cl$: C 35.42, H 2.38, N 41.30; found C 35.53, H 2.41, N 41.25.

2,6-Dichloropuine (4). white solid; yield, 16.4%; m.p.: 182–183°C (literature value: 180–182°C); ^{1}H NMR (DMSO, 400 MHz) δ: 8.43 (s, 1H, —CH), 11.99 (s, 1H, —NH); MS (EI) *m/z*: 187.11 (M-1); Anal. calcd for $C_5H_2N_4Cl_2$: C 31.77, H 1.07, N 29.64; found C 31.69, H 1.11, N 29.62.

2-Chloro-6-anilinepurine (5a). white solid; yield, 86.7 %, m.p.: > 250°C; IR (KBr) ν: 3439, 2781, 1635, 1560, 1496, 1434, 1303, 938, 729 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 7.06 –7.86 (m, 5H, —Ar—H), 8.30 (s, 1H, —CH), 10.21 (s, 1H, *C6*—NH), 13.39 (s, 1H, *N9*—H); MS (EI) *m/z*: 246.2 (M+1); Anal. calcd for $C_{11}H_8N_5Cl$: C 53.78, H 3.28, N 28.51; found C 53.66, H 3.34, N 28.41.

2-Chloro-6-o-chloroanilinepurine (5b). white solid; yield, 61.3 %, m.p.: >250°C; IR (KBr) ν: 3377, 3109, 2961, 1627, 1577, 1474, 1348, 1320, 1246, 962, 930, 787, 741 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 7.28 –7.67 (m, 4H, —Ar—H), 8.26 (s, 1H, —CH), 9.77 (s, 1H, *C6*—NH), 13.01 (s, 1H, *N9*—H); MS (EI) *m/z*: 280.0 (M+1) ; Anal. calcd for $C_{11}H_7N_5Cl_2$: C 47.17, H 2.52, N 25.00; found C 47.29, H 2.43, N 24.89.

2-Chloro-6-p-chloroanilinepurine (5c). white solid; yield, 74.5 %, m.p.: >250°C; IR (KBr) ν: 3264, 3133, 3051, 2763, 2683, 1630, 1588, 1562, 1492, 1444, 1397, 1351, 1254, 936, 847, 805 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 7.30 –7.69 (m, 4H, —Ar—H), 8.51 (s, 1H, —CH), 9.52 (s, 1H, *C6*—NH), 12.00 (s, 1H, *N9*—H); MS (EI) *m/z*: 280.0 (M+1) ; Anal. calcd for $C_{11}H_7N_5Cl_2$: C 47.17, H 2.52, N 25.00; found C 47.28, H 2.47, N 24.87.

2-Chloro-6-o-methoxyanilinepurine (5d). white solid; yield, 78.2 %, m.p.: > 250°C; IR (KBr) ν: 3275, 3140, 3067, 3002, 2955, 2779, 2637, 2069, 1637, 1593, 1565, 1445, 1250, 1175, 1102, 934, 807, 721 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 3.76 (s, 3H, —OCH_3), 6.94–7.70 (m, 4H, —Ar—H), 8.26 (s, 1H, —CH), 10.04 (s, 1H, *C6*—NH), 11.99 (s, 1H, *N9*—H); MS (EI) *m/z*: 276.0 (M+1); Anal. calcd for $C_{12}H_{10}N_5OCl$: C 52.28, H 3.66, N 25.40; found C 52.36, H 3.58, N 25.34.

2-Amino-6-anlilinepurine (6a). white solid; m.p.: > 250°C; ^{1}H NMR (DMSO, 400 MHz) δ: 7.16 –7.98 (m, 5H, —Ar—H), 7.64 (s, 2H, —NH_2), 8.33 (s, 1H, —CH), 11.24 (s, 1H, *C6*—NH), 13.64 (s, 1H, *N9*—H); MS (EI) *m/z*: 227.1 (M+1); Anal. calcd for $C_{11}H_{10}N_6$: C 58.40, H 4.46, N 37.15; found C 58.29, H 4.55, N 37.03.

2-Amino-6-m-chloroanilinepurine (6b). white solid; m.p.: 258–260°C; ^{1}H NMR (DMSO, 400 MHz) δ: 6.75 –7.51 (m, 4H, Ar—H), 7.32 (s, 2H, —NH_2), 8.30 (s, 1H, —CH), 11.17 (s, 1H, *C6*—NH), 12.98 (s, 1H, *N9*—H); MS (EI) *m/z*: 261.3 (M+1); Anal. calcd for $C_{11}H_9N_6Cl$: C 50.68, H 3.48, N 32.24; found C 50.56, H 3.55, N 32.19.

2-Amino-6-p-chloroanilinepurine (6c). white solid; m.p.: >250°C; ^{1}H NMR (DMSO, 400 MHz) δ: 7.12 –7.80 (m, 4H, Ar—H), 7.55 (s, 2H, —NH_2), 8.27 (s, 1H, —CH), 11.05 (s, 1H, *C6*—NH), 13.20 (s, 1H, *N9*—H); MS (EI) *m/z*: 261.3 (M+1); Anal. calcd for $C_{11}H_9N_6Cl$: C 50.68, H 3.48, N 32.24; found C 50.57, H 3.44, N 32.35.

2-Amino-6-p-methoxyanilinepurine (6d). white solid; m.p.: >250°C; ^{1}H NMR (DMSO, 400 MHz) δ: 3.76 (s, 3H, —OCH_3), 6.97–7.84 (m, 4H, Ar—H), 7.54 (s, 2H, —NH_2), 8.27 (s, 1H, —CH), 11.04 (s, 1H, *C6*—NH), 13.28 (s, 1H, *N9*—H); MS (EI) *m/z*: 257.6 (M+1); Anal. calcd for $C_{12}H_{12}N_6O$: C 56.24, H 4.72, N 32.79; found C 56.33, H 4.67, N 32.88.

2,6-Dianlilinepurine (6e). white solid; m.p.: > 270°C; IR (KBr) ν: 3442, 3292, 3221, 3118, 2975, 2853, 1654, 1585, 1411, 1320, 1045, 750 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.96 –7.99 (m, 10H, —Ar—H), 8.53 (s, 1H, —CH), 9.38 (s, 1H, *C6*—NH), 10.21 (s, 1H, *C2*—NH), 12.56 (s, 1H, *N9*—H); MS (EI) *m/z*: 303.1 (M+1); Anal. calcd for $C_{17}H_{14}N_6$: C 67.54, H 4.67, N 27.80; found C 67.66, H 4.58, N 27.89.

2-m-Chloroaniline-6-anlilinepurine (6f). white solid; m.p.: 248–250°C; IR (KBr) ν: 3430, 3228, 3128, 3051, 1634, 1579, 1498, 1434, 1318, 1254, 1177, 745 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.70–7.73 (m, 9H, —Ar—H), 8.54 (s, 1H, —CH), 9.50 (s, 1H, *C6*—NH), 9.74 (s, 1H, *C2*—NH), 13.12 (s, 1H, *N9*—H); MS (EI) *m/z*: 337.1 (M+1); Anal. calcd for $C_{17}H_{13}N_6Cl$: C 60.63, H 3.89, N 24.95; found C 60.56, H 3.91, N 24.87.

2-p-Chloroaniline-6-anlilinepurine (6g). white solid; m.p.: >270°C; IR (KBr) ν: 3425, 3263, 3194, 1662, 1637, 1557, 1491, 1465, 1234, 1105, 948, 748; ^{1}H NMR (DMSO, 400 MHz) δ: 6.84–7.75 (m, 9H, —Ar—H), 8.55 (s, 1H, —CH), 9.55 (s, 1H, *C6*—NH), 9,76 (s, 1H, *C2*—NH), 12.98 (s, 1H, *N9*—H); MS (EI) *m/z*: 337.1 (M+1); Anal. calcd for $C_{17}H_{13}N_6Cl$: C 60.63, H 3.89, N 24.95; found C 60.56, H 3.94, N 24.86.

2-p-Methoxyaniline-6-anlilinepurine (6h). white solid; m.p.: >270°C; IR (KBr) ν: 3442, 3122, 3057, 1648, 1625, 1594, 1557, 1497, 1362, 1237, 1045, 835 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 3.70 (s, 3H, —OCH_3), 6.60–7.72 (m, 9H, —Ar—H), 8.48 (s, 1H, —CH), 9.22 (s, 1H, *C6*—NH), 9.67 (s, 1H, *C2*—NH), 13.07 (s, 1H, *N9*—H); MS (EI) *m/z*: 333.1 (M+1); Anal. calcd for $C_{18}H_{16}N_6O$: C 65.05, H 4.85, N 25.29; found C 65.13, H 4.89, N 25.35.

2-Anliline-6-m-chloroanilinepurine (6i). white solid; m.p. >270°C; IR (KBr) ν: 3210, 3123, 2834, 2590, 2306, 1636, 1579, 1442, 1306, 1235, 750 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.87–7.65 (m, 9H, —Ar—H), 9.56 (s, 1H, *C6*—NH), 10.23 (s, 1H, *C6*—NH), 13.44 (s, 1H, *N9*—H); MS (EI) *m/z*: 337.1 (M+1); Anal. calcd for $C_{17}H_{13}N_6Cl$: C 60.63, H 3.89, N 24.95; found C 60.71, H 3.82, N 25.00.

2,6-Di-m-chloroanilinepurine (6j). white solid; m.p.: >270°C; IR (KBr) ν: 3209, 3131, 2950, 1636, 1587, 1550, 1424, 1292, 1188, 1067, 743 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.89–7.87 (m, 8H, —Ar—H), 8.45 (s, 1H, —CH), 9.65 (s, 1H, *C6*—NH), 10.18 (s, 1H, *C2*—NH), 13.76 (s, 1H, *N9*—H); MS (EI) *m/z*: 371.0 (M+1); Anal. calcd for $C_{17}H_{12}N_6Cl_2$: C 55.00, H 3.26, N 22.64; found C 55.09, H 3.21, N 22.69.

2-p-Chloroaniline-6-m-chloroanilinepurine (6k). white solid; m.p.: >270°C; IR (KBr) ν: 3184, 3122, 2986, 2839, 1636, 1580, 1418, 1299, 1055, 817, 744 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.86–7.85 (m, 8H, —Ar—H), 8.44 (s, 1H, —CH), 9.58 (s, 1H, *C6*—NH), 10.13 (s, 1H, *C2*—NH), 13.68 (s, 1H, *N9*—H); MS (EI) *m/z*: 371.0 (M+1); Anal. calcd for $C_{17}H_{12}N_6Cl_2$: C 55.00, H 3.26, N 22.64; found C 55.08, H 3.21, N 22.68.

2-p-Methoxyaniline-6-m-chloroanilinepurine (6l). white solid; m.p.: 262–264°C; IR (KBr) ν: 3204, 3105, 2958, 1636, 1560, 1508, 1420, 1244, 1184, 1032, 765 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 3.77 (s, 3H, —OCH_3), 6.77–7.68 (m, 8H, —Ar—H), 8.48 (s, 1H, —CH), 9.60 (s, 1H, *C6*—NH), 10.06 (s, 1H, *C2*—NH), 13.32 (s, 1H, *N9*—H); MS (EI) *m/z*: 367.1 (M+1); Anal. calcd for $C_{18}H_{15}ClN_6O$: C 58.94, H 4.12, N 22.91; found C 59.00, H 4.15, N 22.86.

2-Aniline-6-p-chloroanilinepurine (6m). white solid; m.p.: >270°C; IR (KBr) ν: 3281, 3212, 3116, 2856, 2304, 1657, 1616, 1492, 1424, 1311, 1238, 1087, 829, 761 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 6.76–7.57 (m, 9H, —Ar—H), 8.55 (s, 1H, —CH), 9.54 (s, 1H, *C6*—NH), 10.02 (s, 1H, *C2*—NH), 12.94 (s, 1H, *N9*—H); MS (EI) *m/z*: 337.0 (M+1); Anal. calcd for $C_{17}H_{13}N_6Cl$: C 60.63, H 3.89, N 24.95; found C 60.69, H 3.82, N 24.88.

2-m-Chloroaniline-6-p-chloroanilinepurine (6n). white solid; m.p. >270°C; IR (KBr) ν: 3317, 3225, 2975, 2646, 2314, 1662, 1614, 1495, 1416, 1296, 1093, 1035, 825, 737 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 7.16–7.94 (m, 8H, —Ar—H), 8.56 (s, 1H, —CH), 9.49 (s, 1H, *C6*—NH), 9.64 (s, 1H, *C2*—NH), 12.89 (s, 1H, *N9*—H); MS (EI) *m/z*: 371.0 (M+1); Anal. calcd for $C_{17}H_{12}N_6Cl_2$: C 55.00, H 3.26, N 22.64; found C 54.92, H 3.32, N 22.68.

2,6-Di-p-chloroanilinepurine (6o). white solid; m.p.: >270°C; IR (KBr) ν: 3115, 2966, 2864, 2783, 1631, 1579, 1492, 1347, 1251, 934, 825 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 7.38–7.98 (m, 8H, —Ar—H), 8.33 (s, 1H, —CH), 10.36 (s, 1H, *C6*—NH), 10.84 (s, 1H, *C2*—NH), 11.52 (s, 1H, *N9*—H); MS (EI) *m/z*: 371.0 (M+1); Anal. calcd for $C_{17}H_{12}N_6Cl_2$: C 55.00, H 3.26, N 22.64; found C 55.07, H 3.23, N 22.60.

2-p-Methoxyaniline-6-p-chloroanilinepurine (6p). white solid; m.p.: >270°C; IR (KBr) ν: 3125, 2959, 1898, 1652, 1557, 1390, 1234, 1198, 1044, 834, 789 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 3.76 (s, 3H, —OCH_3), 7.40–7.97 (m, 8H, —Ar—H), 8.32 (s, 1H, —CH), 10.34 (s, 1H, *C6*—NH), 10.85 (s, 1H, *C2*—NH), 11.60 (s, 1H, *N9*—H); MS (EI) *m/z*: 367.1 (M+1); Anal. calcd for $C_{18}H_{15}ClN_6O$: C 58.94, H 4.12, N 22.91; found C 58.99, H 4.08, N 22.87.

2-Aniline-6-p-methoxyanilinepurine (6q). white solid; m.p.: >270°C; IR (KBr) ν: 3443, 3122, 3056, 1646, 1626, 1594, 1558, 1497, 1237, 1045, 835 cm^{-1}; ^{1}H NMR (DMSO, 400 MHz) δ: 3.66 (s, 3H, —OCH_3), 6.67–7.73 (m, 9H, —Ar—H), 8.31 (s, 1H, —CH), 9.26 (s, 1H, *C6*—NH), 9.74 (s,

1H, *C2*—NH), 13.12 (s, 1H, *N9*—H); MS (EI) *m*/*z*: 332.0 (M+1); Anal. calcd for $C_{18}H_{16}N_6O$: C 65.05, H 4.85, N 25.29; found C 65.00, H 4.89, N 25.26.

2-m-Methoxyaniline-6-p-methoxyanilinepurine (6r). white solid; m.p.: >270°C; IR (KBr) ν: 3224, 3057, 2953, 1655, 1511, 1300, 1177, 1036, 934, 823, 732 cm^{-1}; ^1H NMR (DMSO, 400 MHz) δ: 3.76 (s, 3H, —OCH_3), 6.78–7.79 (m, 8H, —Ar—H), 8.85 (s, 1H, —CH), 9.48 (s, 1H, *C6*—NH), 10.73 (s, 1H, *C2*—NH), 12.25 (s, 1H, *N9*—H); MS (EI) *m*/*z*: 367.1 (M+1); Anal. calcd for $C_{18}H_{15}N_6OCl$: C 58.94, H 4.12, N 22.91; found C 58.89, H 4.06, N 22.85.

2-p-Chloroaniline-6-p-methoxyanilinepurine (6s). white solid; m.p.: >270°C; IR (KBr) ν: 3114, 2965, 2834, 1909, 1652, 1509, 1360, 1046, 831, 786 cm^{-1}; ^1H NMR (DMSO, 400 MHz) δ:3.77 (s, 3H, —OCH_3), 6.96–7.79 (m, 8H, —Ar—H), 8.93 (s, 1H, —CH), 9.70 (s, 1H, *C6*—NH), 10.63 (s, 1H, *C2*—NH), 11.65 (s, 1H, *N9*—H); MS (EI) *m*/*z*: 367.1 (M+1); Anal. calcd for $C_{18}H_{15}N_6OCl$: C 58.94, H 4.12, N 22.91; found C 58.88, H 4.07, N 22.86.

2,6-Di-p-methoxyanilinepurine (6t). white solid; m.p.: >270°C; IR (KBr) ν: 3123, 2958, 2833, 1888, 1652, 1510, 1360, 1301, 1103, 952, 829 cm^{-1}; ^1H NMR (DMSO, 400 MHz) δ: 3.76 (s, 6H, —OCH_3), 6.92 –7.76 (m, 8H, —Ar—H), 8.72 (s, 1H, —CH), 9.55 (s, 1H, *C6*—NH), 10.85 (s, 1H, *C2*—NH), 11.78 (s, 1H, *N9*—H); MS (EI) *m*/*z*: 363.9 (M+1); Anal. calcd for $C_{19}H_{18}N_6O_2$: C 62.97, H 5.01, N 23.19; found C 63.03, H 4.99, N 23.15.

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