Chinese Chemical Letters Vol. 12, No. 11, pp 965 – 966, 2001
http://www.imm.ac.cn/journal/ccl.html

Synthesis and Characterization of Novel Dimethylgallium Complexes

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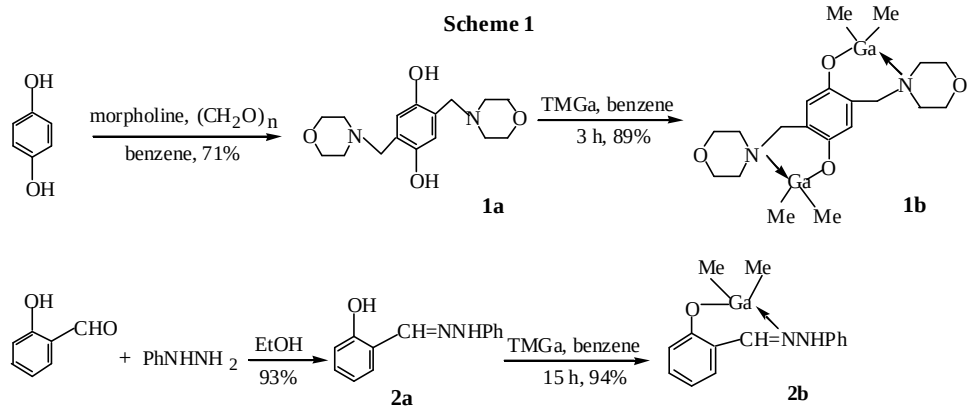
Abstract: Two novel dimethylgallium complexes were synthesized and their structures were elucidated by elemental analysis, ^{1}H NMR, IR and MS spectra.

Keywords: Novel dimethylgallium complexes, synthesis, characterization.

Recently, great attention has been paid to Group IIIA organometallic compounds owing to their wide range of uses in the areas of ceramic semi-conductor materials and diagnosis of diseases[1]. However, most of the relevant studies are limited to monoaminomethylated phenols as ligands[2].

Scheme 1



In this paper, we report the synthesis of compounds (**1a** and **2a**) as a new ligand and their dimethylgallium complexes (**1b** and **2b**) (**Scheme 1**). General procedures for preparation of **1a**, **2a** and **1b**, **2b** were accorded with ref. 2, 3. All new compounds were characterized by elemental analysis, ^{1}H NMR, IR and MS spectra (see **Table 1**).

The complexes are much more stable than $GaMe_3$, and decompose slowly in air. The elemental analysis values of $GaMe_3$ complexes match with calculated (see **Table 1**). A moderate absorption near 530 cm^{-1} in IR spectrum shows the Ga-N stretching vibration

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frequency[2]. In the ^{1}H NMR spectrum, there is a single peak at –0.29 or –0.49 ppm, which is the characteristic signals of protons on the methyl group connecting to Ga. In the MS showed two isotopes Ga^{69} and Ga^{71} signals with the abundance ratio 3:2, the *m/z* of $[M]^+$, $[M\text{-}CH_3]^+$, $[Ga]^+$, $[Ga(CH_3)_2]^+$ and other fragments can confirm the structures of the complexes further.

Table1 The spectral analytical and physical data of new compounds

Compd.	mp (℃)	IR, (KBr, cm^{-1})	^{1}H NMR (300MHz, $CDCl_3$, δ ppm)	MS(EI) *m/z*(intensity %)	Elemental Analysis C, H, N (%)
1a	203-5	3020, 2950, 1510, 1475, 1445, 1375, 1320, 1250, 1185, 1100, 980, 905, 860, 750	2.56 (s, 8H, NCH_2), 3.64 (s, 8H, OCH_2), 3.75 (s, 4H, $PhCH_2N$), 6.50 (s, 2H, ArH), 9.70-10.30 (br.s, 1H, PhOH)	308.1 (M^+, 12.53), 221.1 (100.00), 162.1 (6.15), 136.1 (15.23), 86.1 (56.68), 57.0 (65.62)	Calcd: 62.32, 7.85, 9.08 Found: 62.26, 7.71, 9.19
1b	>250 decomp.	3020, 2950, 1475, 1440, 1345, 1310, 1250, 1205, 1095, 960, 900, 860, 770, 580, 530	-0.29 (s, 12H, $GaCH_3$), 2.54-2.61 (t, 4H, NCH_2), 3.10-3.14 (t, 4H, NCH_2), 3.61-3.69 (t, 8H, OCH_2), 3.90-3.94 (d, 4H, CH_2Ph), 6.56 (s, 2H, ArH)	508.0 (M^+, 3.67), 506.0 (11.02), 503.9 (6.71), 493.5 (0.96), 491.3 (2.76), 488.9 (2.46), 404.9 (3.13), 304.0 (7.61), 101.0(38.32), 99.0 (57.66), 70.9 (17.04), 68.9 (27.08)	Calcd: 47.46, 6.77, 5.54 Found: 47.50, 6.90, 5.45
2b	>150 decomp.	3300,3020, 2950,1600, 1480,1350, 1260,1118, 990,740, 680,530	δ (DMSO): -0.49 (s, 6H, $GaCH_3$), 6.76-7.57 (m, 9H, ArH), 8.16 (s, 1H, CH=N), 10.41 (br.s, 1H, NH)	312.0 (M^+, 0.27), 310.0 (0.48), 297.0 (7.66), 295.0(13.33), 211.1 (21.16), 101.0(1.73), 99.0 (2.41), 70.9 (5.27), 68.9 (8.11)	Calcd: 57.91, 5.51, 9.00 Found: 58.08, 5.63, 9.01

The research of the complex analogues is in progress in our laboratory.

Acknowledgment

This research was supported by 863 Key Research Project.

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Received 5 April, 2001