Studii şi Cercetări Ştiinţifice
Chimie şi Inginerie Chimică, Biotehnologii, Industrie Alimentară

Scientific Study & Research
Chemistry & Chemical Engineering, Biotechnology, Food Industry

2011, **12** (4), pp. 421 – 424

ISSN 1582-540X

SHORT COMMUNICATION

AMINO-2-ETHANE SULFONATO MX_2 (M = Zn, Cd, Hg, X = Cl, Br) ADDUCTS: SYNTHESIS AND INFRARED STUDY

Dinora De Barros, Libasse Diop*

Université Cheikh Anta Diop, Faculté des Sciences et Techniques, Département de Chimie, Laboratoire de Chimie Minérale et Analytique (LACHIMIA), Dakar, Sénégal

Corresponding author: dlibasse@gmail.com

Received: January 05, 2011
Accepted: June 22, 2011

Abstract: Eight amino-2-ethane sulfonato MX_2 adducts have been synthesized, their infrared study carried out. The structures are discrete, the anion behaving mainly as a chelating ligand and in the dinuclear adducts as a bichelating ligand.

Keywords: *adducts, amino-2-ethane sulfonate, bichelating, chelating, discrete structures, infrared, supramolecular structures*

© 2011 ALMA MATER Publishing House, "VASILE ALECSANDRI" University of Bacău. All rights reserved.

INTRODUCTION

The X ray study of some amino-2 ethane sulfonato compounds have been reported [1-7]; in these compounds, the amino-2ethane sulfonate anion behaves mainly as a monochelating ligand and in some cases as a monocoordinating one, through the nitrogen atom. In the dynamic of understanding the coordinating behavior of oxyanions, our group has yet reported several papers [8-17] and initiate here the study of the interactions between $Me_4NNH_2(CH_2)_2SO_4\cdot 3H_2O$ and $Et_4NH_2N(CH_2)_2SO_3\cdot 5H_2O$ with MX_2 (M = Zn, Cd, Hg; X = Cl, Br) which has yielded eight new adducts, infrared study of which have been carried out and structures suggested on the basis of spectroscopic data.

EXPERIMENTAL

$Me_4NH_2N(CH_2)_2SO_3\cdot 3H_2O$ (**L_1**) [C = 28.57 (28.41); H = 9.52 (9.30); N = 11.11 (10.56)] and $Et_4NH_2N(CH_2)_2SO_3\cdot 5H_2O$ (**L_2**) [C = 34.88 (35.02); H = 10.46 (10.62); N = 8.14 (8.23)] have been obtained by neutralization of amino 2-ethane sulfonic acid by 20% aqueous solutions of Me_4NOH or Et_4NOH. When the obtained solutions are submitted to water evaporation, a powder is collected, washed with ether and kept under P_2O_5 in a dessicator.

On allowing ethanolic solutions of (**L_1**) or (**L_2**) and MX_2 (M = Hg, Cd, Zn; X = Cl, Br) in specific ratios - reported between brackets - to react, precipitation occurs. All precipitates have been stirred no less than two hours and washed with hot ethanol.

The analytical data reported have allowed suggesting the following formulae [% calculated (% founded)]:

[**A**] $[Me_4NNH_2(CH_2)_2SO_3]_2\cdot CdBr_2$ [1 – 2L1]:
C = 21.55 (20.21); H = 5.43 (5.01); N = 8.38 (7.82); Br = 23.90 (23.91);

[**B**] $Me_4NNH_2(CH_2)_2SO_3\cdot HgBr_2$ [1 – 2L1]:
C = 12.90 (13.30); H = 3.25 (3.44); N = 5.01 (4.97); Br = 28.60 (28.62);

[**C**] $Me_4NNH_2(CH_2)_2SO_3\cdot ZnCl_2$ [4 – 1L1]:
C = 21.54 (21.01); H = 5.42 (5.54); N = 8.37 (7.66); Br = 21.19 (21.20);

[**D**] $Me_4NNH_2(CH_2)_2SO_3\cdot ZnBr_2\cdot 2H_2O$ [4 – 1L1]:
C = 15.89 (15.85); H = 3.56 (4.44); N = 6.18 (6.49); Br = 35.24 (34.26);

[**E**] $Me_4NNH_2(CH_2)_2SO_3\cdot 2CdCl_2$ [8 – 1L1]:
C = 12.76 (12.24); H = 3.21(3.46); N = 4.96 (4.57); Cl = 25.10 (25.74);

[**F**] $Me_4NNH_2(CH_2)_2SO_3$. $2CdBr_2$ [8 – $1L_1$]:
C = 9.70 (10.22); H = 2.44 (2.66); N = 3.77 (4.01); Br = 43.03 (44.12);

[**G**] $Me_4NNH_2(CH_2)_2SO_3\cdot 2HgCl_2$[4 – $1L_1$]:
C = 9.72 (9.83); H = 2.45 (2.49); N = 3.78 (3.76); Cl = 19.13 (20.09);

[**H**] $[Et_4NNH_2(CH_2)_2SO_3]\cdot 2CdCl_2$ [1 – $2L_2$]:
C = 19.45 (19.37); H = 4.21 (4.03); N = 4.53 (4.35).

The elemental analyses have been performed by the CNRS “Service Central d’Analyses” Vernaison, France. The infrared spectra were recorded by means of a PE 580 (4000 – 200 cm^{-1}) or a FTIR-Nicolet (600 – 50 cm^{-1}) spectrometer at the University of Padova (Italy), the sample being as Nujol mulls using CsI or polyethylene windows. Infrared data are given in cm^{-1} [abbreviations: (vs) very strong, (s) strong, (m) medium, (w) weak]. All the chemicals were purchased from Aldrich Company and used without any further purification.

RESULTS AND DISCUSSION

The bands due to amino 2-ethane sulfonate anion change very little in frequencies. The number of bands cannot be correlated with the type of coordination of the oxyanion as for no substituted anions: sulphate, selenite, nitrate. The more relevant bands of the anion are localized as follows: νNH_2 as a very strong and wide absorption - 3200/2600 cm^{-1}, δNH_2 as a doublet - 1650 and 1580 cm^{-1}, νSO_3 as strong bands - 1200/1000 cm^{-1} and δSO_3 - 750/370 cm^{-1}.

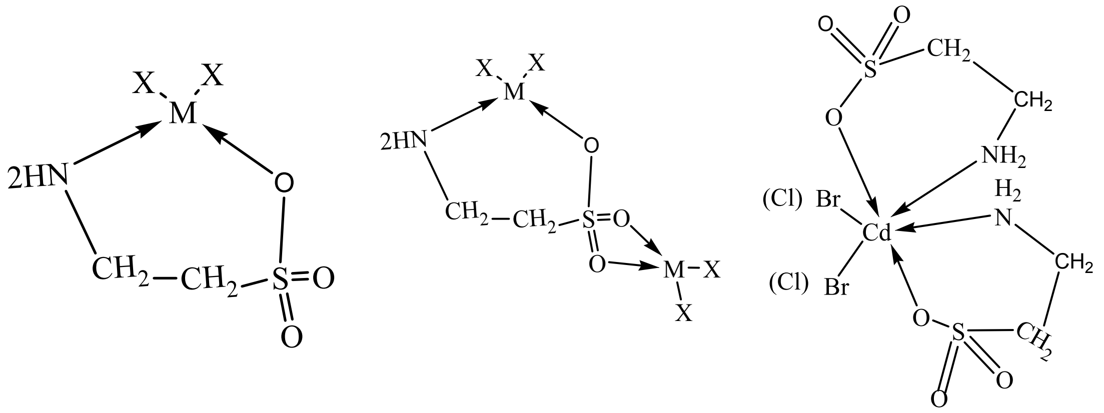
We therefore only focused on IR bands involving the metal centres to suggest structures.

Let us consider these specific and relevant infrared data of the studied adducts:

νM-X = 150(s), (νM-O + νM-N) = 280(w) for [**A**];
νM-X = 159(s), (νM-O + νM-N) = 327(w) for [**B**];
νM-X = 275(s), (νM-O + νM-N) = 327(m) for [**C**];
νM-X = 206(vs), (νM-O + νM-N) = 327(m); νM-X = 327(m) for [**D**];
νM-X = 205(s), (νM-O + νM-N) = 303(m) for [**E**];
νM-X = 151(s), (νM-O + νM-N) = 301(w) for [**F**];
νM-X = 260(m), (νM-O + νM-N) = 335(w) for [**G**];
νM-X = 205(s), (νM-O + νM-N) = 320(w) for [**H**].

$Me_4NNH_2(CH_2)_2SO_3 \cdot MX_2$ [A, B, C, D] – M = Zn, Cd, Hg; X = Cl, Br

Considering the anion behaving as a monochelating ligand, the suggested structure is reported in Figure 1 a.



a *b* *c*

Figure 1. *Proposed structures for the compounds: a)* ***A***, ***B***, ***C***, ***D****; b)* ***E***, ***F***, ***G****; c)* ***H***

In the case of [**D**], the water molecules are lattice ones.

$Me_4NNH_2(CH_2)_2SO_3 \cdot 2MX_2$ [E, F, G] – M = Cd, Hg; X = Cl, Br

Adding another molecule of MX_2 to the adducts studied above leads to a structure containing a bichelating anion - Figure 1 b.

$2(Et_4N)NH_2CH_2CH_2SO_3 \cdot CdCl_2$ [H]

It has been possible to coordinate two taurinate ions on $CdBr_2$, $CdCl_2$ and $SbBr_3$ giving so the structure reported in Figure 1 c.
All these structures can lead to supramolecular architectures when NH---O secondary interactions are considered.

CONCLUSION

In the adducts and derivatives studied in this paper, the oxoanion behaves as a chelating or a bichelating ligand. The structures are discrete; supramolecular ones are very plausible when NH---O hydrogen bonds responsible of the strong absorption on the IR spectra of all these compounds are considered.

REFERENCES

1. Minacheva, L.K., Khabashova, T.S., Sakharova, V.G., Porai-koshits, M.A., Tsivadare, A.Y., Pantashvili, T.V., Shechlokov, R.N.: *Koord. Khim. (Russ.) (Coord. Chem.),* **1984, 10**, 1122;
2. Murata, M., Kojima, M., Kita, M., Kashino, S., Yoshikawa, Y.: *Chem. Letters,* **1996**, **675**;
3. Murata, M., Kojima, M., Kita, M., Kashino, S., Yoshikawa, Y.: *Acta Cryst. Sect C: Cryst. Struct. Comm.,* **1997**, **53**, 1761;
4. Jiang, Y.-M., Cai, J.-H., Liu, Z.-M., Lui, X.-H.: *Acta Cryst Sect E,* **2005**, **61**, m878;
5. Cai, J.-H., Jiang, Y.-M., Yin, X.-J., Lui, X.-H.: *Acta Cryst Sect E*, **2006**, **62**, m72;
6. Jiang, Y., Wang, X., Ying, X., Zhong, F.: *Inorg.Chem.Comm.*, **2006**, **9**, 1063;
7. Cai, J.-H., Jiang, Y.-M., Ng, S.W.: *Acta Cryst Sect E*, **2006**, **62**, m3059;
8. Diop, C.A.K., Okio, K.Y.A., Diop, L., Mahieu, B.: *Main Group Met. Chem*., **2000, 23**, 9;
9. Diop, C.A.K., Diop, L., Toscano, R.A.: *Main Grain Group Met Chem*., **2002**, **25** (5), 327;
10. Gueye, O., Qamar, H., Diop, L., Diop, C.A., Russo, U.: *Polyhedron,* **1993**, **12** (10), 1245;
11. Sall, A.S., Diop, L., Russo, U.: *Main Group Met. Chem*., **1995**, **18** (5), 243;
12. Okio, K.Y.A., Diop, L., Russo, U.: Scientific *Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**,**10** (1), 11;
13. Diallo, W., Diassé-Sarr, A., Diop, L., Mahieu, B., Biesemans, M., Willem, R., Kociok-Köhn, G., Molloy, K.C.: *Scientific Study & Research - Chemistry & Chemical Engineering, Biotechnology, Food Industry*, **2009**, **10** (3), 207;
14. Diallo, W., Okio, K.Y.A., Diop, C.A.K., Diop, L., Russo, U.: *Main Group Met. Chem.,* **2009**, **32** (2), 93;
15. Qamar Kane, H., Okio, K.A., Fall, A., Diop, L., Russo, U., Mahieu, B.: *Main Group Met. Chem.,* **2009**, **32**, 4;
16. De Barros, D., Diop, L., Mahieu, B.: *Main Group Met. Chem*., **2009**, **32** (6), 341;
17. De Barros, D., Diop, L., Mahieu, B.: *Main Group Met. Chem*., **2010**, **33** (1), 91.