SYNTHESIS AND CHARACTERIZATION OF COMPLEXES BASED ON FRAGMENTS $[Mo_2O_2S_2]^{2+}$ FOR APPLICATIONS IN BIOLOGY

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Molybdenum is a very important oligo-element for life in plants, animal and humas. Indeed, It is known in more than 50 enzymes and usually Mo atoms in +VI or +V oxidation states are surrounded by oxygen, nitrogen and sulfur atoms. On this basis, coordination complexes based of oxo-sulfurated clusters such as $[Mo_2O_2S_2(H_2O)_6]^{2+}$ could be relevant for the design of new bioactive compounds. The cyclic polyoxothiomolybdate $K_{2-x}(NMe_4)_x[I_2Mo_{10}O_{10}S_{10}(OH)_{10}(H_2O)_5]\cdot 20H_2O$ acts as a source of cationic binuclear units $[Mo_2O_2S_2(H_2O)_6]^{2+}$ which can lead to the formation of many types of spectacular (supra)molecular structures with various dimensions and architectures [1-3]. One surprising application found for such $[Mo_2O_2S_2(H_2O)_6]^{2+}$-based inorganic substances is their use in different domains of biology such as biomass growing or antioxidant for instance [4, 5].

On their side, thiosemicarbazone ligand (noted H_nL) are widely recognized for their diverse range of biological activity, including antifungal, antibacterial and anti-cancer effects and it is also known that bonding them to cations of transition metals leads to molecules about 10 times more efficient [6, 7].

Therefore, this motivated us to synthesize $[Mo_2O_2S_2(H_{n-1}L)_2]$ (Fig. 1) complexes and to explore their potential biological properties. Here we report several new binuclear Mo(V) coordination compounds with various thiosemicarbazone ligands and their solid and liquid-state characterizations.

Various analysis techniques were used to establish the composition, structure, coordination of ligands to the metal ion, such as: IR, NMR, EDX, MALDI-TOF, elemental and X-ray analysis. The NMR study (Fig. 2) showed usually the presence of two isomers of geometry in

different proportions, each bit being doubled. X-ray analysis (Fig. 3) confirms the presence of two isomers, because for some compounds the cis isomer is obtained, and for others the trans isomer. Likewise, surprisingly, for thiosemicarbazone ligands bearing phenolic gorups, the OH grouping remains free, unlike the classical coordination in the case of 3d metals. Coordination mode consists in the formation of rings with 4 atoms, coordination by N imine and S thiol. The MALDI-TOF results (Fig. 4) show that only the monomeric species are present. The stoichiometry is 1: 2 and that the molecular formulas are in agreement with other analyzes. The compounds have been tested for antioxidant and antifungal activity (Fig. 5).

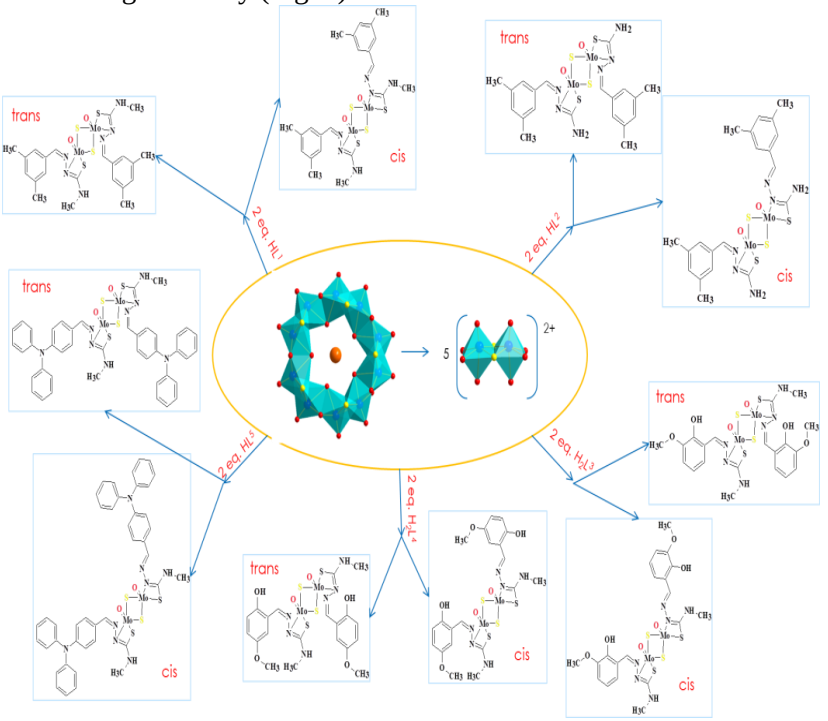


Fig. 1. The presumed structure of the synthesized compounds $Mo_2O_2S_2(L^1)_2$; $Mo_2O_2S_2(L^2)_2$; $Mo_2O_2S_2(HL^3)_2$; $Mo_2O_2S_2(HL^4)_2$ and $Mo_2O_2S_2(L^5)_2$

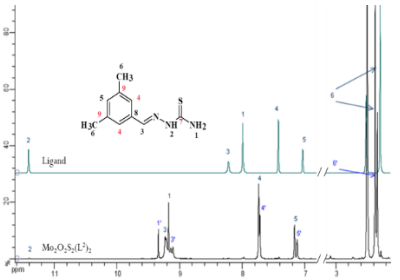


Fig. 2. ^{1}H NMR, δ ppm (300 MHz/DMSO-d_6) spectrum of the synthesized ligand (HL^2) and complex $Mo_2O_2S_2(L^2)_2$

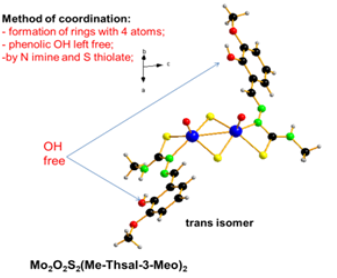


Fig. 3. X-ray diffraction of $Mo_2O_2S_2(HL^3)_2$

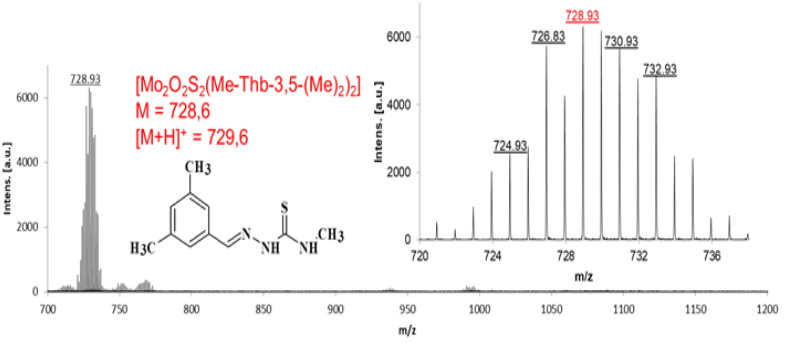


Fig. 4. The MALDI-TOF study of the compound $Mo_2O_2S_2(L^1)_2$

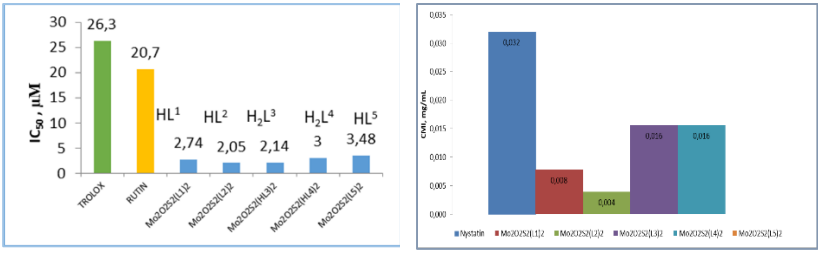


Fig. 5. Antioxidant (a) and antifungal (b) activity of Mo(V) coordination compound

The data obtained indicate that the coordinating compounds of molybdenum after antioxidant activity exceed 7.5-12.8 times the activity of Trolox, used as a standard in medicine and they have antifungal activity against fungi of the species Cryptococcus Neoformans *CECT 1043*, an activity 2-8 times higher than Nystatin.

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