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Summary

The purpose of the present study is to carrying out a survey about the concentration of heavy metals such as: zinc, lead, copper, manganese, cadmium and cobalt in Suez Canal region. Soil, and sediments samples were collected from different sites of Ismailia, Port-Said and Sharkia governorates. Sampling sites axes was defined using GPS apparatus and located on the maps of satellite images. Samples of sediments were chosen to represent a different environmental sedimentation conditions with expected different pollution levels, types and different water sources. Soil samples sites were chosen to cover a wide range of texture, salinity levels, different irrigation water sources with different water salinity levels, and different crop-cultivation patterns. Water samples were collected from the same sites to represent either the canal water which sediment sample was taken from or irrigation water for the land which soil sample was taken from.

Thirty-four locations were chosen to estimate: the available content of the metals which mentioned before, mechanical analysis, total carbonate %, organic matter %, salinity and soluble cations and anions. Also samples of irrigation water collected to estimate the salinity, soluble cations and anions, SAR (sodium adsorbed ratio) and RSC (residual sodium carbonate).

Potentiometric titration measurements of ligand, Zn^{2+}-Tiron and Pb^{2+}-Tiron complexes are carried out to estimate the ionization constants of the free ligand and the formation constants of the formed complexes. The ionization constants of the ligand was calculated at different temperatures 15 ^{o}C, 25 ^{o}C and 35 ^{o}C

respectively to study the effect of temperature on the ionization process. Furthermore, values of stability constants were discussed in terms of molecular structure of the ligand and nature of the metal ions used.

Solid complexes were prepared from the reaction of these elements with Tiron by refluxing equimolar amount of Tiron with their nitrate salts, and the resulted complexes were characterized using the following techniques:

a. Elemental analysis.

b. conductivity measurements in H_2O.

c. Spectral measurements including:

-Infrared spectra.

-Nuclear magnetic resonance (^{1}H-NMR).

d. Thermal analysis: (TGA and DTA).

from the obtained data we can summarize the following:

1- The clay content of different soil samples varied between 4 and 32 %, while the silt content ranged between 2 and 54 % and the sand content also varied greatly between 36 and 92 % in all soil and sediments.

2- Calcium carbonate content of the soil and sediments ranged from 0.43 to 10.43% according to the amounts of the shells presented in the samples.

3- Organic matter contents of the sediments samples 1, 2 and 3 are found 1.88, 6 and 0.81 % respectively, the highest value in sample 2 is due to the sewage effluents that considered a useful sources of nitrogen, phosphorus and organic matter. The percentage of the soil samples are ranged between 0.13 – 3.83 %, except in the samples number 5 and 28 their percentage are found

5.85 and 5.18 % respectively. These higher values may be attributed to the organic fertilizers which add to the soil.

4- The soil and sediments samples contained different amounts of the total soluble salts. The data indicated that the total soluble salts as expressed by electrical conductivity in the soil and sediments samples varied from 0.1 to 49.39 dSm^{-1}. The highest values of samples 9, 11 and 12 strongly support the contribution of both the Nile and the Sea in forming these soils, i.e., fluvio-marine origins and due to the soil are virgin and not reclaimed.

6- Total soluble salts of the water samples expressed by electrical conductivity varied from 0.3 to 3.58 dSm^{-1}, except sample number (1) equals to 11.48 dSm^{-1}.

7- Chelating agents partially (DTPA) provide the most promising micronutrients cations soil test:

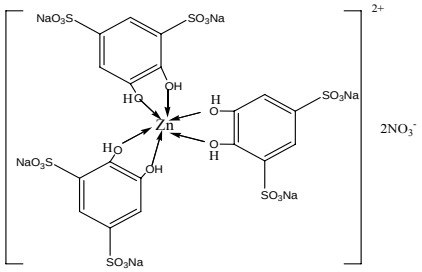
The available Zn ranged from 1.492 - 17.848 ppm for soil samples and from 2.236 - 82.172 pmm for sediments samples. Pb ranged from 0.024 - 9.414 ppm for soil samples and from 1.466 - 126.77 pmm for sediments samples. While Cu ranged from 0.38 - 23.908 ppm for soil samples and from 5.122 - 48.256 pmm for sediments samples. Cd ranged from 0.002 - 0.106 ppm for soil samples and from 0.006 - 0.262 pmm for sediments samples. While Mn ranged from 0.622 - 78.284 ppm for soil samples and from 33.524 - 56.774 pmm for sediments samples and Co ranged from 0.006 - 0.7 ppm for soil samples and from 0.44 - 0.734 pmm for sediments samples.

8- The ionization constants of the free ligand were determined by potentiometric titration and revealed the values (pKa_1=7.88 and pKa_2=12.6), and they are inversely proportional to

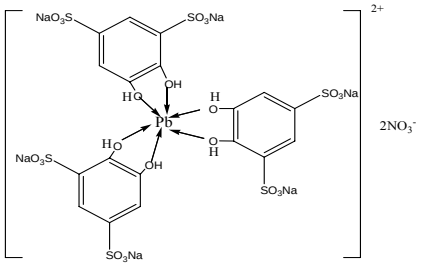
the temperature. The stability constants also were determined by potentiometric titration and revealed the values:

For Zn^{2+}-Tiron complex log K_1, log K_2 and log K_3 are 11.02, 9.85 and 8.9 respectively, while for Pb^{2+}-Tiron complex log K_1, log K_2 and log K_3 are 14.09, 13.05 and 10.15 respectively.

9- The formed complexes were characterized by different instrumental techniques, suggesting the following structure:



Postulated structure of (Zn^{2+}-Tiron) complex



Postulated structure of (Pb^{2+}-Tiron) complex