

ELECTROCHEMICAL DETERMINATION OF THE METAL COMPLEXING CAPACITY

D. OMANOVIC, I. PIZETA, Z. PEHAREC and M. BRANICA

Center for Marine Research Zagreb, Rudjer Boskovic Institute, P. O. Box 1016,
41001 Zagreb, Croatia

Metal complexing capacity (MCC) is the parameter of a seawater which shows in the indirect way the amount of ligands which form inert complexes with particular heavy metal and can be of interest in characterization of the purity of seawater. Its determination needs a measuring procedure and a data treatment, which will be discussed (RUZIC, 1982) and shown in Figure 1.

Depending on the working electrode used, we distinguish two procedures, first using static mercury drop electrode (SMDE) assembly and the second using thin mercury film glassy carbon disk electrode (TMFGCDE) assembly (OMANOVIC *et al.*, 1994).

Concerning SMDE assembly, from cathodic measurements in 2-3 orders of magnitude higher concentration range than found in natural seawater samples ($5 \times 10^{-5} \text{ mol l}^{-1}$) with model solutions with copper (II) and ethylenediaminetetraacetic acid (EDTA), it is concluded that MCC determination would not be possible because peaks of free and labile complexed copper and the inert one are so close that no deposition potential was available where only the free copper would be reduced and accumulated for ASV technique which is necessary in low concentration range. Triton-X-100 (T-X-100) separates the waves of free and inert complexed copper. In order to find the best conditions for Cu CC determination, dependencies of Cu oxidation peak current height as well as Cu EDTA reduction peak potentials on concentration of T-X-100 and adsorption time and adsorption potential have been measured. Also the linearity of standard additions of copper in presence of T-X-100 is checked.

Concerning TMFGCDE assembly, from cathodic measurements, it has been noticed that the separation of mentioned waves, was dependent on the thickness of the mercury film. When the film is thicker, these two waves are closer, approaching to the signals corresponding to the mercury drop electrode.

Pseudopolarograms of model solutions with copper (II) for both electrode assemblies are presented. They are the fingerprints of the measured solution and give us the answer about the accumulation potential, where only the free and the labile copper would be accumulated.

When comparing the TMFGCDE with the SMDE regarding MCC determination, we have to point out that TMFGCDE has the detection limit an order of magnitude lower. As a procedure it is simpler and needs no addition of chemicals to the sample. Because of the better stirring possibilities, the double layer is thinner which enables better distinguishing between labile and inert complexes and in that sense better MCC determination.

The limitations of that electrode assembly caused by cell wall adsorption will be presented. Advantages of SMDE are the renewal of the electrode surface which is important in the presence of strong surface active substances.

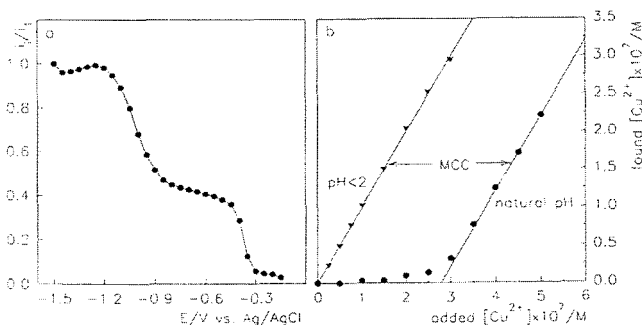


Figure 1. a) A pseudopolarogram of $3 \times 10^{-7} \text{ M}$ copper (II) in 0.55 M NaCl in the presence of $2 \times 10^{-7} \text{ M}$ EDTA. b) Metal complexing capacity determination

REFERENCES

- I. RUZIC, 1982. Theoretical aspects of the direct titration of natural waters and its information yields for trace metal speciation, *Anal. Chim. Acta*, 140 99-113.
D. OMANOVIC, Z. PEHAREC, T. MAGJER, M. LOVRIC and M. BRANICA, 1994. Wall-jet electrode system for anodic stripping voltammetry, *Electroanalysis*, in press.