DETERMINATION OF POLYMERIC ORGANIC MATERIAL CONTAINING "N-CATALYST" IN SEAWATER BY CONSTANT CURRENT CHRONOPOTENTIOMETRIC STRIPPING ANALYSIS

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Abstract

Catalytic properties and surface activity of nitrogen containing polymeric organic material (N-POM) were analyzed by constant current chronopotentiometric stripping analysis (CPSA) in seawater. CPSA proved to be a suitable method for determination of low concentrations of N-POM in seawater by measuring its "presodium" catalytic peak H. A protein human serum albumin (HSA) (15 % of N) was used as a model compound and the concentration of N-POM from natural seawater samples was expressed in HSA concentration equivalents.

Keywords: Electrochemistry, Adriatic Sea, Organic Matter

Introduction

Chronopotentiometric stripping analysis (CPSA) is an electrochemical technique in which preconcentrating step proceeds at negative potentials where amalgam is formed, followed by stripping step in which constant current is applied to strip the accumulated material. CPSA peak which appears is not due to the faradaic but to the catalytic reduction of hydrogen. That peak appears more positively on potential scale than usual hydrogen wave, preceeding the reduction of sodium ions. It is named peak "H" or catalytic hydrogen or "presodium" wave and a key organic molecule is called a "presodium" catalyst [1] already reported about CPS detection of peak H catalyzed by sulphur atoms in polysaccharides excreted from plankton cultures. A more negative peak H, at -1.7 V, was observed as well and a connection with the presence of polymeric organic matter containing N catalytic atoms was supposed [3]. Seawater samples were collected in the Northern Adriatic in 4 seasons: June and October 2008 and in January and March 2009, at surface (0.5 m depth) and bottom (~31 m depth), as well in some other areas in the Adriatic.

Results and Discussion

From peak H height measured in the seawater samples we could not characterize N-POM on molecular basis, as for that some specific separation techniques and characterization methods should be included. Macroaggregates found in the Northern Adriatic are characterized by high C/N ratio due to their low protein content having carbohydrates as a major component. Surface samples were richer in N- POM than bottom samples in all seasons. We calculated N-POM/SAS and N-POM/DOC and concluded that N-POM made a minor part of SAS and DOC in seawater samples comprising a few percent.

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References

1 - Mader, P., Vesela, V., Dorcak, V., Heyrovsky, M., 2001. The 'presodium' hydrogen evolution at the dropping mercury electrode catalyzed by simple cysteine peptides. Collect Czech Chem Commun 66: 397–410.

2 - Ciglenecki,I., Plavšic, M., Vojvodic, V., Cosovic, B., Pepi, M., Baldi, F., 2003, Evidence of mucopolysaccharide transformation by sulfide: comparisons between an enriched mixed benthic diatom culture and natural mucilage,*Mar. Ecol. Prog. Ser, 263*, 17-27.

3 - Strmecki, S., Plavšic, M., Cosovic. B.,2009. Constant current chronopotentiometric stripping analysis of "N-catalyst" in sodium chloride solution and seawater, *Electroanalysis*, in press.