

Application of stripping voltammetry to the speciation of dissolved Zinc and Cobalt in the Southern Ocean

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We report the application of voltammetric stripping analysis to the chemical speciation of the bio-essential trace metals (1) Zinc and (2) Cobalt in seawater samples from the Southern Ocean. The samples were collected from February – April 2008 on transects along the Zero Meridian south of Africa and through the Drake Passage during the Polarstern expedition ANT24-3 as part of the IPY project GEOTRACES.

Zn speciation information was obtained by anodic stripping voltammetry (ASV) with a thin mercury film rotating glassy carbon disc electrode (TMF-RGCDE). Zn ligands and their complex stability constants were determined by Zn titration of the sample. Complementary Pseudopolarograms were recorded with unaltered seawater from selected bottles. Overall we analysed the Zn speciation from 6-8 bottles distributed over the whole water column at each of 8 stations along the two transects. Labile Zn (Zn') along with free Zn (Zn^{2+}) was high and unlikely to limit primary productivity during the time of study. In the Zn rich Southern Ocean waters the major fraction of Zn binding ligands was present as Zinc complexes.

For Co speciation a modification of an existing catalytic cathodic stripping voltammetry (CSV) detection with Dimethylglyoxime (DMG) was developed. The new method represents an alternative to the conventional catalysis with Nitrite opening a way around the large amount of Nitrite salts needed (e.g. 0.5 mol/L) thus reducing the risk of metal contamination and additionally alleviating experimental uncertainty caused by a change of the ionic strength. Currently experiments are being performed concerning the catalysis mechanisms. We are working towards a full mechanistic understanding of the processes involved in the catalytic Co determination with CSV. Results of this ongoing work shall be presented at this time.