

THE ADSORPTION OF HUMIC SUBSTANCES FROM SEAWATER AT THE
HANGING MERCURY DROP ELECTRODE

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Summary. The adsorption of humic substances from seawater at the hanging mercury drop electrode (HMDE) has been measured as the function of time, concentration and the applied electrode potential by out-of-phase a.c. voltammetry, until the steady state was obtained. The correlation between the bulk concentration of humic substances and their chemical composition on their mass transport to the electrode of different surface charges is discussed.

Résumé. *L'adsorption des substances humiques de l'eau de mer sur la goutte pendante a été mesurée en fonction du temps, de la concentration et du potentiel d'électrode appliqué au moyen de voltamétrie de courant alternatif hors de phase jusqu'à ce que la condition d'équilibre dynamique soit atteinte. La corrélation entre la concentration de substances en solution et leur composition chimique sur leur transport de masse à l'électrode de différentes charges de la surface est discutée.*

The aim of this study was to determine the rate of elimination of humic substances from the dissolved phase due to their adsorption at the charged interfaces. The investigated concentration of humic substances closely corresponds to that naturally occurring in sea water. For this purpose a very sensitive electrochemical method, out-of-phase a.c. voltammetry, was applied (1). Using this method the adsorption of trace amounts of the surface active substances from seawater could be followed (2).

The increase with time of the surface coverage of the indicator electrode (HMDE) by humic substances is observed measuring the capacitive current, which decreases as the coverage of the electrode by the surface active substances increases. The decrease of the capacitive current with time is observed at an adjusted potential until the steady state is obtained. In order to speed up the transport of humic substances to the electrode, the solution was stirred at the constant rate (800 rpm). The surface charge of the electrode can be varied changing the

applied electrode potential. This provides the opportunity to perform the measurements at different surface charges and to follow the respective differences in the amount of adsorbed humics.

The chemical composition of four humic acids and two fulvic acids originating from marine, estuarine and lagoonal sediments (3,4) is correlated with their adsorption properties at three different potentials. The humic acids are more hydrophobic and therefore more strongly adsorbed at the HMDE than the fulvic acids. The amount of the adsorbed humic substances at the HMDE is strongly dependent on their concentration and the electrode potential at which the adsorption is measured. The results will be discussed with respect to the dependence of the rate of transport of humic substances to the surfaces of different charges, when their sign changes from positive over neutral to the negative one.

The results of these investigations are important for a better understanding of the elimination processes of dissolved humic substances from the solution phase by adsorption on the suspended particles.

References

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