

ELECTROCHEMICAL BEHAVIOUR OF THE LEAD IN THE PRESENCE OF THE PIRUVIC ACID THIOSEMICARBAZONE

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Continuing our efforts to find new organic agents for adsorptive accumulation of the toxic metal ions on the mercury dropping electrode, allowing to reduce significantly the detection limits, we present here the results of investigation of the electrochemical behavior of the lead ions in the presence of the piruvic acid thiosemicarbazone, APTSC (see fig.). In water solutions Pb(II) forms in presence of the piruvic acid thiosemicarbazone a complex of the molar ratio Pb:L = 1:2, confirmed by amperometric titration, which one is easily adsorpted on the mercury electrode. On the voltamogramme of the water solutions in the pH range 5-6 the reduction peak of the adsorpted species is observed at the potential -0,5 V. Adsorptive nature of this peak is confirmed by the value of the rate coefficient and by variation of the dropping time with applied potential in separate solutions and their mixtures (see fig.).

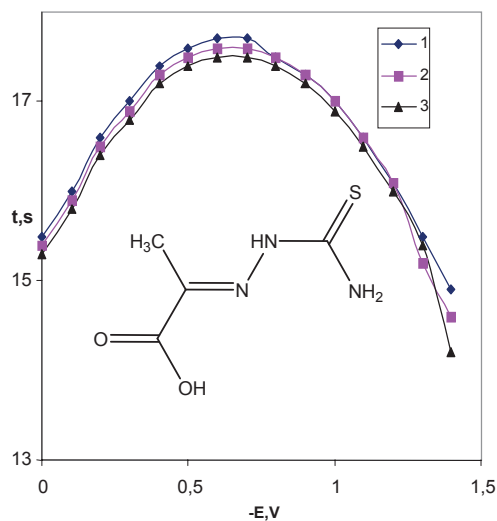


Fig. Variation of the dropping time with applied potential in solutions of

- 1) 0.01 M KCl;
- 2) 0.01 M KCl + $5 \cdot 10^{-5}$ M APTSC
- 3) 0.01 M KCl + $5 \cdot 10^{-5}$ M APTSC + $5 \cdot 10^{-5}$ M Pb²⁺

Interferences of the Zn(II), Cd(II), Ni(II), Co(II), Cl⁻, Br⁻, I⁻, CNS⁻, CH₃COO⁻, etc. ions have been investigated and optimized for the maximal manifestation of the Pb(II) signal. The optimal potential for accumulation of the lead ions from solutions containing the given thiosemicarbazone is -0,15 V. The maximal admitted time for accumulation is 3 min. For the linear cathodic scanning of the potential (1 V/s), the function $I_p = f(C_M)$ is linear in conditions of stationary diffusion and dropping mercury electrode up to the concentration of the lead $2 \cdot 10^{-6}$ M. Using the accumulation of the lead species during 180 s on the stationary mercury drop the detection limit diminished to the $3 \cdot 10^{-8}$ M. Smaller detection limits should be reached increasing the surface of mercury drops. The main parameters of the adsorption, such as adsorption constant, particles transfer coefficients, free adsorption energy, maximal concentration on the interface, as well as the surface corresponding to one adsorbed particle on the electrode, were determined. Analytical potentialities of the investigated phenomenon for determination of small lead concentration were evaluated.