Abstract

Chenodeoxycholic acid is the most common representative of bile acids in the human body. This work studies its electrochemical reduction at stationary mercury-based electrodes using the DC voltammetry and differential pulse voltammetry. These were performed on a silver solid amalgam electrode modified by a mercury meniscus (m-AgSAE) and a hanging mercury drop electrode (HMDE).

On the scale of pH 4.0 – 12.0 offers CDCA one reduction signal in the area of highly negative potentials around −1400 mV. There is a distinctive change in the behavior of CDCA for buffers of pH lower than 6.0, compared to other pH values. This change is observable on both m-AgSAE and HMDE through the DC voltammetry and DPV methods. This happens due to protonization of carboxyl group on C_{24}. This change is strongest with pH of 4.0. For that reason, CDCA was studied in two environments – a 0.04 mol.l^{-1} borat buffer (pH 9.1) – methanol (9:1) and in a BR buffer (pH 4.0) – methanol (9:1). In both environments, the lowest detection threshold has been reached through the DC voltammetry method on HMDE.

The cyclic voltammetry method was used to study the electrode process. Again, measuring in pH 9.1 and pH 4.0 was done. For pH 9.1, this is a quasireversible process controlled by adsorption of both electrodes studied. For pH 4.0 is the process for lower polarization speeds controlled by diffusion, which was proved for both electrodes. During higher speeds, a negative peak is created, atypically showing cathodic current. Both electrodes are acting analogically in this pH. The atypical CDCA behavior during pH of 4.0 could be related to the adsorption and desorption processed on the surface of the electrode.