Influence of electrodeposition potential on composition and ion exchange of polypyrrole films in aqueous hexafluoroaluminate featured by EQCM molar mass to charge factors.

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Streszczenie

EQCM gravimetry in a (10^{-8},10^{-6}) g range was used for measurements of time processes of the potentiostatic deposition and redox state switching of polypyrrole in aqueous sodium hexafluoroaluminate. Time/potential dependencies of molar mass to charge factors determined from EQCM chronoamperometry and EQCM cyclic voltammetry were considered to reveal how the electrodeposition potential affects composition and ion-exchange properties of the resulting polymer film. Polypyrrole was synthesized at constant potentials, from +0.55V to +0.80V vs. SCE. The redox switching and accompanying ion-exchange were monitored in (+0.6,−0.6)V and (+0.6,−1.2)V vs. SCE potential windows. A lower mean chain length (polymerization degree) and a higher contribution of sodium in the mixed ion-exchange processes can be postulated for the thin polypyrrole deposit when it involves a higher content of the 2D chain packing structure. The distinct behavior corresponds to polypyrrole electropolymerized at the slowest rate, i.e. at +0.55V vs. SCE, which is know to result in the highest content of the 2D packing structure in the deposited film and the lowest mean reversible oxidation degree of the polymer. The molar mass to charge factor of EQCM gravimetry is useful for comparative studies of the rate processes involving electrolyte and electrode species, facilitating for their chemical identification.

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