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Mass Transport during the Redox Reaction of Polypyrrole and Poly(N-substituted pyrrole) Films in Aprotic Solvents

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The mass transport mechanism of conducting polymer films in aprotic solutions has not been investigated as extensively as in aqueous solutions. In this study, ion and solvent transports during the redox reaction of polypyrrole(PPy), poly(N-methyl pyrrole) (PMPy) and poly(N-phenyl pyrrole) (PPhPy) films in aprotic solvents such as acetonitrile (AN) and propylene carbonate (PC) have been investigated with the cyclic electrochemical quartz crystal microbalance (EQCM) technique. For PPy films, the break-in processes are observed at the first reduction sweep and cation, anion, and solvent take part in mass transport. The approximate numbers of accompanying solvent per cation are obtained in potential region where cation transport is dominant. Whereas for poly(N-substituted pyrrole) films, no break-in process is observed and cation transport is negligible. In addition, the solvent transport changes its amount and direction with the kind of the dopant anion and the solvent used at film synthesis.