

E1-03: Polyaniline: influence of polymerization current density

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Polyaniline (PANI) was synthesized in propylene carbonate by galvanostatic

electrochemical polymerization at current densities between 16 and $500 \mu\text{A}/\text{cm}^2$. Earlier results for polypyrrole showed that low and high current density films had different properties. The films synthesized at low current density had a higher conjugation length and a more regular structure. The corresponding effect in PANI was investigated by cyclic voltammetry and UV/visible spectroscopy. Simultaneous measurement of cyclic voltammograms and the absorption of selected spectral lines was used because of the complex nature of the PANI system which involved several redox systems as well as forms differing in the degree of protonation and morphology.

The main result was that the method of galvanostatic synthesis at very low current densities. ($\approx 16 \mu\text{A}/\text{cm}^2$) produced polyaniline polymers of different, and more well-defined structure than those prepared at higher current densities. The standard method of *in situ* layer-by-layer polymerization of conducting polymers during cyclic voltammetry often resulted in uncontrolled and unmeasured current densities of $0.5\text{-}2 \text{ mA}/\text{cm}^2$ which produced a film that probably had a less regular structure containing more defects. Therefore, the galvanostatic method at low current densities was preferred.