Int. J. Electrochem. Sci., 14 **(2019)** 238 – 249

International Journal of
ELECTROCHEMICAL
SCIENCE
www.electrochemsci.org

Electrode materials based on Micro-emulsion Polymerized Polyaniline and Their Capacitive Property

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doi: 10.20964/2019.01.10

Received: 14 September 2018 / *Accepted:* 22 October 2018 / *Published:* 30 November 2018

The conductive polyaniline (PANI) electrode materials with different morphologies were prepared by micro-emulsion polymerization with dodecylbenzene sulfonic acid (DBSA) as the dopant and surfactant, and ammonium persulfate (APS) as the oxidant. The concentration of DBSA was crucial in tailoring the morphology of PANI. Electrochemical tests showed that the capacitive properties of the electrode materials were influenced markedly by their morphologies and conductivities. At low DBSA concentration, the obtained PANI nanoribbon (PANI-1) electrode processed high specific capacitance (573 F g^{-1} at a current density of 0.2 A g^{-1}) and excellent rate performance (78% capacitance retention from 0.2 to 10 A g^{-1}) but showed poor cycling stability. Furthermore, the specific capacitance and rate performance of the resultant PANI electrodes were decreased with increase in the concentration of DBSA. At high DBSA concentration, the specific capacitance and rate performance of the obtained PANI nanoparticle (PANI-4) electrode decreased to 205 F g^{-1} (0.2 A g^{-1}) and 63% (from 0.2 to 10 A g^{-1}), respectively. Nevertheless, it possessed superior cycling stability with just 8% capacitance loss after 2000 charging/discharging cycles.

Keywords: Polyaniline; Dodecylbenzene sulfonic acid; Micro-emulsion polymerization; Electrode material; Supercapacitor

FULL TEXT