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Abstract
Polyaniline (PANI) is a conducting polymer that has been widely studied for electronic and optical applications. Which the investigation of materials with nanotubular structure is of great importance from both scientific and technological points of view due to their unique propertied and promising potential applications in nanodevices. In recent year, PANI nanostructures, including nanowires, nanotubes, and nanofibers have been studied with the expectation that such materials will possess a variety of advantages.
In this,Self-doping polyaniline (SPANI) nanofibers were synthesized by using self-assembly process consisting of a self-doping monomer (o-aminobenzenesulfonic acid, SAN) and aniline (AN). SAN plays the key roles of a self-doping monomer and a surfactant in the process of forming nanostructures. TEM and SEM results revealed that the morphology, average diameter of the resulting nanostructures depended on the mole ratio of AN to SAN and reaction conditions. NMR, FTIR, XPS, UV-Vis spectra were used to describe the molecular structures of the nanostructures. X-ray diffraction was used to characterize the degree of order in nanometer range structures. Results revealed that the molecular structures of polymer chains were similar to those of the emeraldine form of polyaniline (PANI). The doping degree ranged from 21 to 27 % corresponding to the AN/SAN mole ratio from 4 to 1.
In the second part, The self-doped polyaniline demonstrates nanotube and nanofibril structures corresponding to the AN/SAN mole ratio of 4 and 1, respectively, through the examination of transmission electron microscopy. Reduction of ionic silver along the nanotubes resulted in the production of nanorod about 140 nm in diameter. An immersing self-assembly method was developed to buildup an SPANI nanofibril or nanofilm on an ITO glass, providing an electrode material to fabricate a stable electrochromic device. Total solid-state electrochromic device was fabricated under atmospheric conditions and presented the following configuration:
ITO │ SPANI nanofilm ‖ WPU/LiClO4 ‖ PEDOT-PSS │ ITO
This device showed blue at +1.5 V and pale grey at -1.5 V with respect to a SPANI potential, respectively.
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