

In order to develop high functional substances, dissimilar materials were mixed in solution. Nano fibers were made from the solution by electro spinning. The applications of the nano fibers were discussed and experimented.

Various materials can be mixed and functional nanofibers were made from them by electro spinning if the fibers can be spined. In this study, poly acrylic nitrile (PAN) and other materials were dispersed in dimethyl formamide (DMF). The dispersed materials were polymer, tetraethoxysilane (TEOS), silicon (Si) nano-particles and etc. These fibers were carbonized by heat-treatment at 800-1000°C (5°C/min heating rate). Then carbon nanofibers (CNFs) were obtained.

Structure of the nano fibers was analysed by scanning electron microscopy (SEM) and transmission electron microscopy (TEM) combined with image processing. Distributions of the mixed materials were observed by elemental mapping using Energy Dispersive X-ray spectrometry (EDX).

The macroscopic shapes of the substances obtained by electro spinning were like nonwoven fabric. The diameters of the nanofibers are from 300 to 500 [nm]. The CNFs made from PAN only were contained micro pores of which diameters are less than 7 nm. The complicated structure is thought to be made by entanglement of long-chain molecules of PAN, and as the results, the micro pores were formed. The spaces among the fibers also form macro pores.

The macro pores were used for heavy oil adsorption experiments. The created CNFs were used as electrode materials for electric double layer capacitor. The CNFs contained Si was applied to electrode of lithium ion secondary batteries (LIBs).