MANUFACTURE OF HIGHLY CONDUCTIVE CARBON FIBERS USING CARBON NANOTUBES AND A NEW WET SPINNING PROCESS

Yong-Min Kim[1], Ho-Sung Yang[1] and Woong-Ryeol Yu[1*]

[1] Department of Materials Science and Engineering, Seoul National University, 599 Gwanak-ro, Gwanak-gu, Seoul 151-742, Republic of Korea
(*Corresponding author, Email: woongryu@snu.ac.kr, Web Page: http://nscm.snu.ac.kr) provide

Carbon fibers (CFs) have excellent mechanical properties such as high tensile strength and modulus and low density. Therefore, CF-reinforced plastics (CFRPs) have been used in aerospace, machine and transportation industries. On the other hand, CFs are relatively less conductive than other conductive materials. CFs, if their conductivity is significantly increased, can be used in new applications such as flexible devices and sensors. For this, carbon nanotubes (CNTs) have been added to CFs due to their high electrical and thermal conductivity, disclosing that the microstructure of CNTs and polymer composites such as their orientation and arrangement is critical to improving their conductivity. In this study, we developed high conductive CFs by controlling the microstructures of CNT-added poly (acrylonitrile) (PAN) fibers. A new process, so-called current-assisted wet spinning in which an electric field is applied to the doping solution in a wet spinning system, was used. Using the process, the orientation and arrangement of CNTs and voids in the CNT/PAN composite fibers were controlled to increase the electrical conductivity of CFs. First, the microstructure of CNT/PAN composite fibers was characterized. The composite fibers were then carbonized into CFs. Transmission and electron microscopy and 2D wide-angle and small-angle X-ray diffraction studies were carried out to investigate the microstructure of CFs. The electrical and mechanical properties of CFs were measured by two-probe method and single-fiber tensile test. Detailed results will be presented at the Conference.