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 제일모직(주)

**Industrial Perspective of Polycarbonate Nanocomposites
 : Rheology and Electrical Properties**

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CNT/polymer nanocomposites became a new type of lightweight and superb functional material for various applications such as electronics, energy storage, molecular sensors and biomedical application. To achieve proper properties, however, several technical issues should be resolved. One of the technical problems is how to induce and keep the homogeneous distribution of CNT in polymer matrix.

In this study, CNT/PC(polycarbonate) nanocomposites with various multiwall carbon nanotube(MWNT) were prepared by using lab scale twin extruder(co-rotating, intermeshing). To investigate the effects of CNT orientation on the electrical conductivity of CNT/PC nanocomposites, two types of sample preparation method were used, compression molding(minimal shear and orientation) and extruding through capillary(various shear and orientation). Melt rheological properties of CNT/PC nanocomposites were obtained using MI machine with load change from 1.2 Kg_f to 6.7 Kg_f at 280 °C. Shear stress and rate can be determined by

$$\tau_w \cong 8.97 F_p (Pa) \quad \gamma_{aw} = 1.845 \frac{MI}{\rho_m} (s^{-1})$$

where F_p is the load (Kg_f), MI is the melt flow index (g/10min), and ρ_m is the melt density of nanocomposites.

At a fixed CNT composition, the orientation of CNT reduces the number of connection between nanotubes, showing that the nanotube network is disturbed by shear. Electronic microscope confirmed that the formation of a conducting pathway through the strand sample is reduced significantly due to the orientation along the shear direction. Reflecting these processing issues in CNT dispersion, in this study, the correlation between CNT dispersion and electrical properties of CNT/PC nanocomposites was systematically studied in rheology perspective.

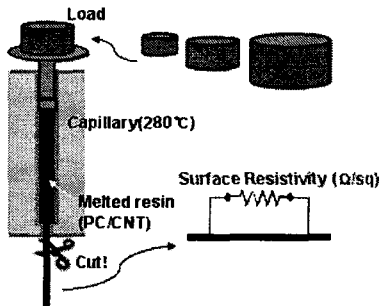


Fig. 1. Schematic diagram of the MI machine with various loads.

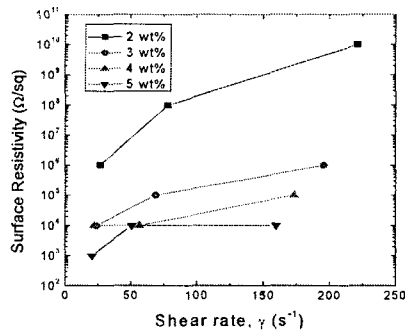


Fig. 2. Electrical resistivity as a function of shear rate with various concentrations of CNT in CNT/PC nanocomposites.