Electrical Properties of the Modified Electroconductive PET and Nylon 6.

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Electrically conducting PET and Nylon 6 films were prepared by introducing amide group or cyan group into PET and Nylon 6 films and then introducing Cu_xS, which is known as the p-type semiconductor, into the grafted films. This process can be divided into three stages as followed. (a) Graft copolymerization of acrylamide(AM) or acrylonitrile(AN), which is capable of coordinating to cuprous ions. (b) Adsorption of the cuprous ions to the coordinating sites. (c) Ion exchange reaction with active S atom to impregnate Cu_xS crystals. the graft copolymerization of AM and AN was investigated using benzoyl peroxide in the case of PET and ceric salt in the case of Nylon 6 as the initiator. Optimum conditions of the graft copolymerization and for the introducing of Cu_xS were determinded.

Electrical conductivity of the Cu_xS-treated PET and Nylon 6 film was 10^{-1} S/cm, it was higher by order of 10^{17} than that of the original PET film and 10^{11} than that of the original Nylon 6 film.

Electrical conductivity measurements have been made on Cu_xS-treated PET and Nylon 6 films in the temperature region between 20°C and 200 °C, Cu_xS-treated films have been observed to have two transition temperature at about 100°C and 180°C, respectively. It should be reasonable to consider that the conductivity behavior 100°C and 180°C is attributed to the character of a metastable structure of the cuprous sulfide. Temperature dependence of conductivity of the Cu_xS-treated PET and Nylon 6 films was investigated and compared with that of original PET and Nylon 6 films. And the current-voltage characteristics and time dependence of conductivity of samples were investigated. Conduction mechanism of the Cu_xS-treated films was not dependent on matrix polymers but

dependent on Cu_xS crystal, and the conduction is mainly electronic. The electrical conducting properties of the Cu_xS-treated films is considered to be due to a Cu_xS-network on the surface of the film.

The morphology of grafted and Cu_xS-treated film surface was investigated with SEM. And using Energy Dispersive X-ray Analysis(EDAX), x value of Cu_xS was calculated and also degree of dispersion of Cu_xS into films was investigated. T_g and T_m of grafted and Cu_xS-treated films were investigated by using DSC. T_m was not varied by grafting and Cu_xS introducing but T_g of the grafted film was decreased slightly but T_g of Cu_xS-treated film was higher than that of the grafted film. The degree of crystallinity was calculated by using DSC and density gradient column.