Effect of Lithium Salt on the Structure of Polyacrylonitrile Fibers

Hong Sung Kim and Hyun Hok Cho *

Technical Research and Development Center,
Hanil Synthetic Fiber Ind., Co., Ltd.
* Department of Textile Engineering, College of Engineering,
Pusan National Univ.

Although polyacrylonitrile(PAN) has been the center of much industrial attention in recent years, the structure of PAN still remains unclear. The reason may be that this polymer belongs to the group of neither typical amorphous polymers nor semicrystalline polymers. This is reflected by the lack of agreement to the structural model of PAN and by the diversity of interpretations to various experimental results. These various interpretations are caused by the presence of strong dipolar nitrile groups in PAN molecule, because the special character to this polymer is influenced according to the ordering of these dipolar nitrile groups. For the purpose to gain better insight into the structure of PAN fiber, This investigation was undertaken to study the structural change of PAN by lithium salt which effects directly in dipole-dipole interaction of the dipolar nitrile groups. And the results were interpreted in terms of the change in the degree of bound nitrile groups on the base of the concept of the two-phase structure which seems to be generally favored in recent years.

That PAN fiber to be treated by Lithium salt had larger crystallinity and smaller crystallite size than untreated fiber was ascertained by wide-angle X-ray diffraction. The degree of bound nitrile group for the treated fiber, nevertheless, was decreased according to IR spectra and dynamic mechanical measurement. Those facts

support that the presence of some bound nitrile groups in disordered region can not be denied as resulted by the study of dielectric relaxation for PAN [1]. Therefore, these bound nitrile groups may be distributed randomly in disordered region. And also Those facts may be explained as the mean size of polymer segments which are limited by the two ends of continuous bound nitrile groups is increased by the treatment of Lithium salts. The results of IR spectra as well as thermo-mechanical properties indicates that the degree of bound nitrile groups in disordered region of the treated fiber was decreased.

From these observations, the structure of fiber treated by salts is consisted of the ordered and disordered region. And both of the regions seem to have larger mean size of polymer segments than that of untreated fiber.

Reference

1) A.K.Gupta and N.Chand, J. Polym. Sci. Polym. Phys. Ed., **18**, 1125 (1980)