STRUCTURAL EVOLUTIONS OF POLYACRYLONITRILE FIBERS STABILIZED IN NITROGEN ATMOSPHERE

Liang Chen, Jie Liu,* Jieying Liang, Xiaoxu Wang

(State Key Laboratory of Organic-Inorganic Composites, College of Materials Science and Engineering, Beijing University of Chemical Technology, Chao-Yang District, Beijing 100029, China)

A thermal stabilization process of polyacrylonitrile (PAN), which is typically done in air, is required in order to prepare PAN-based carbon fibers. In this work, the structural evolution of PAN fibers stabilized in nitrogen is systematically investigated by using Differential Scanning Calorimeter (DSC), Elementary Analysis (EA), Fourier Transform infrared spectroscopy, Wide Angle X-ray Diffraction (WAXD) and density measurement. The results indicated that: 1) PAN fibers stabilized in nitrogen atmosphere have stronger thermal reaction behaviors than in the air, which reflected physical and/or chemical structural changes; 2) stabilized PAN fibers have relatively larger crystallite size and higher amount of ladder structures than PAN precursor, which improves the stability and the heat tolerance in the subsequent thermal oxidative stabilization and high-temperature carbonization process; 3) heated in different temperature, PAN precursor may have been converted into intermediate cyclized structure that could accelerate subsequent reactions, which cannot be found clearly in air.