이성분 PPS 섬유를 이용한 내열성 에어 필터 미디어

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Bi-component PPS Fibers for Air-filter Media with Heat Resistance

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1. Introduction

Poly-phenylene sulfide (PPS) is a linear polymer having the phenylene group combined with sulfide at the 1, 4 position. PPS is a crystalline polymer with glass transition temperature of 88℃ and melting point of 285℃[1]. PPS is a high-performance engineering thermoplastic, with good thermal stability, excellent chemical resistance, inherent flame resistance, and precision moldability[2]. The bi-component melt-spinning process, in which two polymers are co-extruded to form a single filament with designed cross-sectional arrangement, has received considerable commercial interest owing to its potential applications in the production of various speciality fibers like crimped fibers for thermal bonding, electrical conducting fibers, ultra-fine fibers, and etc[3]. Sheath-core fibers include concentric sheath-core fibers and eccentric-type sheath-core fibers, each situation, both sheath and core 's merits can be exhibited, moreover, fibers show the properties that is peculiar to sheath-core fibers. PPS has been popularly used as filtration material recently. But it is too expensive for wide use, in PPS/PA6 sheath-core fibers, the cost of PA6 is much lower than that of PPS, so the total cost of fibers will be reduced. In addition, eccentric-type sheath-core structure imparts fibers three-dimensional crimp, the fibers will exhibit excellent bulkiness, which will improve efficiency of filtration felt. In the present study, sheath-core type bi-component fibers of PPS and PA6 were produced by co-extruding. These polymers through an annular die using two different extruders. The section of the fibers was observed, and effects of draw ratio and acid exert on fibers were investigated.

2. Experimental

2.1 *Materials*

PA6 was supplied by Balin Company, Hunan, China $\overline{M}$ =18000. PPS was obtained from Kureha Chemical Industry, KCI, under the trade name Fortron, with a weight average molecular weight of 55,000. Sulfuric Acid was supplied by Pinghu chemical reagent factory; 98% analytic purity; molecular weight: 98.08.

2.2 *Spinning machine and Spinning*

The spinning machine was a bi-component spinning machine ABE Co, Ltd, Japan which was composed of two extruders and gear pumps. Both PPS and PA6 were dried for at least 24 h at

125 ○C *in vacuoa* to secure a completely moisture-free state. The core/sheath weight ratio was 50/50. PPS/PA6 sheath/core fibers were produced by extruding the melt PPS as the sheath and PA6 as the core through an annular spinneret using two different extrusion systems. The filaments emerged from the spinneret face in to air and begin to cool. After the filaments had traveled far enough to become solid they were brought together and wound up, at a speed of 803m/min.

3. Results and Discussions

3.1 Cross section of PPS/PA6 sheath/core fibers

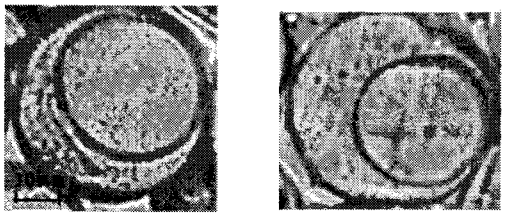

Fig.1 the cross section of fibers

The eccentric-type sheath-core fibers in Figure 1 should be due to PA6 melt is less viscous than PPS melt, the viscosity of PPS and PA6 at spinning temperature is 161.879 and 74.121Pa.S, respectively. When flowing in the same capillary, the less viscous component tends to preferentially wet the wall, known as Coanda effect, then eccentric-type sheath-core fibers were formed. The eccentric-type sheath-core imparts fibers three-dimensional crimp, which will improve efficiency of filtration felt.

3.2 Acid resistant test of fiberss

The acid resistant test results are shown in table 4, it is found that weight of fibers reduced about 50% after dealt with acid. In fig.3 the time is plotted against tensile strength, it is seen that tensile strength of fibers reduces from 2.68CN/dtex to about 2.0CN/dtex after dealt with acid, the strength of fibers shows little change as time extended. The decrease of tensile strength could be attributed to drawbacks exist in fibers, which become obvious because of the erosion of the PA6 core.

4. Conclusions

PPS/PA6 eccentric-type sheath-core fibers has been spun in the research. Enhancing draw ratio, the tensile strength of fibers increased, and fibers exhibited three-dimensional crimps which will improve efficiency of filtration felt.