Prof. Chi Wang

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Research Interests

1. **Nanofibers preparation via electrospinning process:** Electrospinning is a potential process to prepare polymer fibers with diameters of nano-meter scale, ranging from 20 to 1000 nm, depending on the polymer solution properties and processing parameters. Effects of processing variables and rheological properties of polymer solutions on the morphology and internal structures of the nanofibers have been studied. We have proposed some appropriate scaling laws between the morphologies of cone/jet/fibers and processing variables. In addition, high-temperature electrospinning is also developed in our laboratory to prepare polymer fibers possessing semicrystalline nature, which sometimes become infeasible using conventional room-temperature electrospinning due to the solubility problems. At present, many kinds of nanofibers (temperature sensitive PNIPAM, PE, PP, PET, PBT, PVA, PAN, PS, PEI, CNT/polymers, and biodegradable PLA and PHB etc.) have been successfully prepared in our laboratory. The nanofiber applications in the fields of absorption/desorption of volatile organic vapors, controlled release of drug, cell culture and polymer composites have been pursued.
2. **Structure/morphology/property relations of polymers and nanocomposites:** syndiotactic PS/isotactic PS/atactic PS polymers and their blends with carbon nanotubes and graphenes provided systematic models to exhibit varieties of crystalline modification, lamellar structure, spherulitic morphology and phase segregation behaviors developed in these nanocomposite systems. Some scaling models for rheological percolation and electrical conductivity percolations have been developed. In addition, the effect of added nanofibers on the crystallization of polymer matrix is studied. We have performed various characterization techniques on these samples, such as synchrotron radiation, light scattering, wide-angle X-ray diffraction, small-angle X-ray scattering, in-situ FTIR, polarized light microscopy, DSC, AFM, TEM, and SEM.

Representative Publications

(1).“Syndiotactic polystyrene nanofibers obtained from high-temperature solution electrospinning process”, **Macromolecules** 2010, 43, 2371-2376.

(2).“Biodegradable core/shell fibers by coaxial electrospinning: processing, fiber characterization and its application in sustained drug release”, **Macromolecules** 2010, 43, 6389-6397.

(3).“Solution-electrospun isotactic polypropylene fibers: processing and microstructure development during step-wise annealing”, **Macromolecules** 2010, 43, 9022-9029.

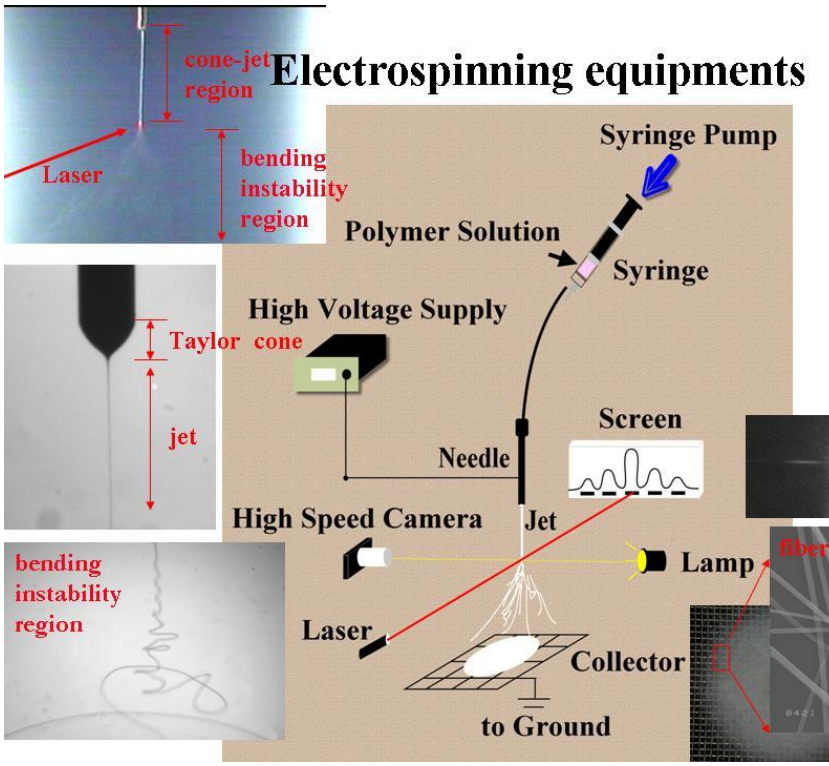
(4).“Rheological and conductive percolation laws for syndiotactic polystyrene composites filled with carbon nanocapsules and carbon nanotubes”, **Carbon** 2011, 49, 2334-2344.

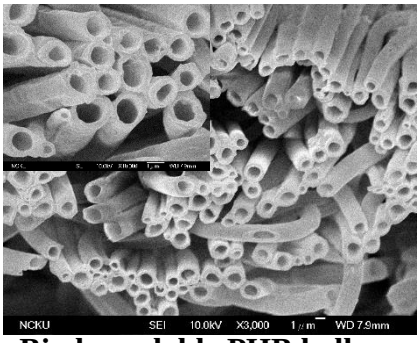
(5).“Effect of tacticity on viscoelastic properties of polystyrene”, **Macromolecules** 2011, 44, 6155-6161.

(6).“Solution-electrospun poly(ethylene terephthalate) fibers: processing and characterization”, **Macromolecules** 2012, 45, 7939-7947.

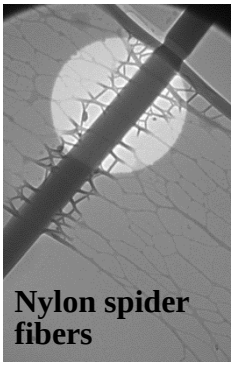
(7).”Electrospun nanofiber-reinforced polypropylene composites: nucleating ability of nanofibers”, **Composites Science and Technology** 2016, 126, 1-8.

1. Electrospinning Process for Polymer Nanofibers



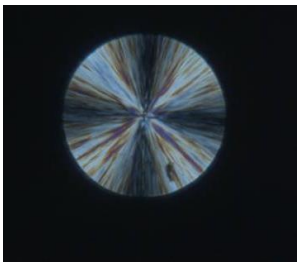


Biodegradable PHB hollow fibers

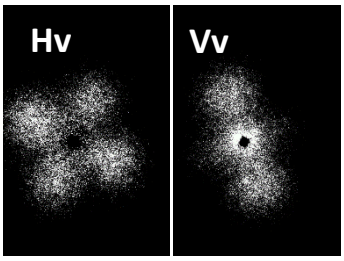


Nylon spider fibers

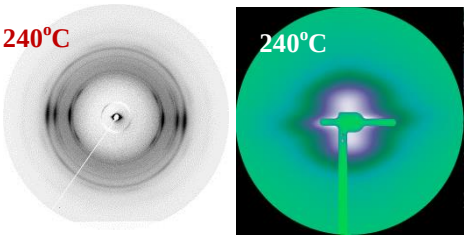
2. Microstructure of Polymers and Nanocomposites



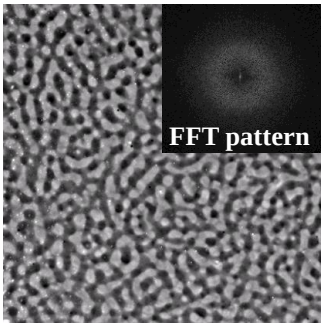
iPS spherulite observed under POM.



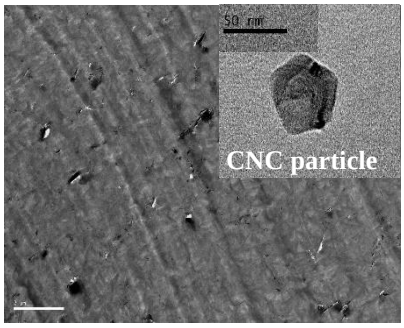
Hv and Vv patterns of sPS at 120°C by small-angle light scattering.



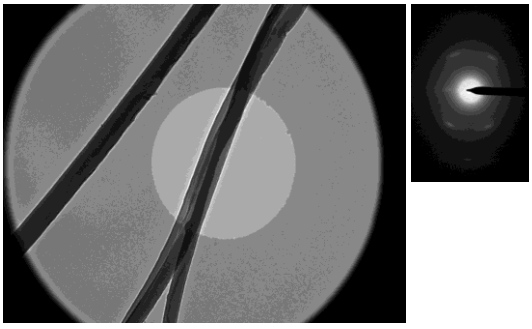
2D wide-angle and small-angle X-ray scattering patterns of electrospun PET nanofibers



Phase separation of sPS/iPS at 300°C.



TEM image of sPS/CNC composite.



TEM image of sPS nanofibers. Inset: electron diffraction pattern