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Needleless electrospinning of nanofiber nonwovens and highly-twisted nanofiber yarns

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Abstract

Electrospinning is a simple, but efficient and versatile, technology to produce polymeric nanofibers for diverse applications. This technique has been shown many advantages such as universality in processing polymeric materials, eases of controlling the fiber diameter and functionality, and flexibility to generate fibrous membranes of various geometries. Although the novel applications of electrospun nanofibers have been extensively explored, the technology development for mass electrospinning of nanofibers has been hampered. In most cases, nanofibers are electrospun in the form of nonwoven webs. Nanofiber yarns, nanofiber bundles having long continuous length and interlocked fibrous structure, are expected to create new opportunities to develop more complicated fibrous structures with well-defined three-dimensional architectures and better mechanical performance, but still remain difficulties to produce on large scale. In our recent study, we have developed needleless electrospinning systems to produce nanofiber nonwoven mats and nanofiber yarns. By examining the effect of various parameters on nanofiber/yarn diameter, fiber production rate and yarn twist, we have found that electric field and the distribution of electric field intensity on the fiber generator are important parameters to control the fiber quality and productivity but there are still some issues with electrospinning nanofiber yarns using needleless spinnerets. This talk introduces our recent research progress in these areas.

Biography

Professor Tong Lin received his PhD degree in physical chemistry from the Chinese Academy of Sciences in 1998. After several years of postdoctoral research in Australia and USA, he joined Deakin University in 2003, and works as a Research Academic, Associate Professor and now Chair Professor and Associate Director for the Australian Future Fibres Research and Innovation Centre. He has been an active researcher in the fields of functional polymers, fibrous materials, and electrospinning. He has published over 150 peer-reviewed journal articles, 5 books and more than 90 other papers on polymer nanofibers and functional fabrics.