Nanofibers for biomedical applications

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Nanofiber technology is an exciting area attracting the attention of many researchers as a potential solution to the current challenges in the biomedical field such as drug delivery systems, burn and wound care, and treatment for various diseases. Nanofibers are attractive in this field for several reasons. First, there appear several amazing characteristics such as very large surface area to volume ratio (this ratio for a nanofiber can be as large as 103 times of that of a microfiber), flexibility in surface functionalities, and superior mechanical performance (e.g. stiffness and tensile strength) compared with any other known form of the material. Second, nanofibers can be fabricated into sophisticated macro-scale structures. The ability to fabricate nanofibers allows renewed efforts in developing hierarchical structures that mimic those in animals and human. On top of that, a wide range of polymers can be fabricated into nanofibers to suit different applications. Nanofibers are most commonly fabricated through electrospinning, which is a low cost method that allows control over fiber morphology and is capable of being scaled-up for mass production. This lecture will explore the popular areas of biomedical nanofiber development especially in the field if drug delivery applications.

Recent publications

1. El-Refaie Kenawy, Gary L. Bowlin, Kevin Mansfield, John Layman, David Simpson, Elliot H. Sanders and Gary Wenk, Release of tetracycline hydrochloride from electrospun poly(ethylene-co-vinylacetate), Poly(lactic acid), and a blend, J. Controlled Release, 81, 57-64, 2002.

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3. Mohamed El-Aassar, Moustafa M.G. Fouda and El-Refaie Kenawy, Electrospinning of Functionalized Copolymer Nanofibers from Poly (Acrylonitrile-co-Methyl methacrylate), Volume 32, Issue 1, Spring 2013, Advances in Polymer Technology, DOI: 10.1002/adv.21329

4. El-Refaie Kenawy, Fouad I. Abdel-Hay, Mohamed H. El-Newehy and Gary E. Wnek, Processing of polymer nanofibers through electrospinning as drug delivery systems, Materials Chemistry and Physics 113, 296–302, 2009.

5. El-Refaie Kenawy, Yasser R. abdel-Fattah, Antimicrobial activity of Modified and Electrospun Poly(vinyl Phenol),Macromolecular Bioscience,2, 261-266, 2002.

6. Mohamed H. El-Newehy, Salem S. Al-Deyab, El-Refaie Kenawy, and Ahmed Abdel-Megeed, "Nanospider Technology for the Production of Nylon-6 Nanofibers for Biomedical Applications," Journal of Nanomaterials, vol. 2011, Article ID 626589, 8 pages, 2011. doi:10.1155/2011/626589.

Biography

Professor El-Refaie Kenawy is the Vice Dean for Postgraduate Studies and Research, Faculty of ScienceTanta University and he is distinguished Professor of polymer chemistry at University of Tanta, Egypt. He is internationally recognized in the field of Polymer Chemistry. He is a graduate of Tanta University, Egypt. He did his PhD. work according to channel Scheme at Strathclyde University, UK. He worked as postdoctoral fellow and Visiting Professor at many international universities as Pisa University, Gent University, Virginia Commonwealth University, Tokyo Institute of Technology, and Tanta University. Professor Kenawy is a member of editorial board of many international journals. He participated actively in many international conferences. In 2004, he was Abdul Hameed Shoman Award for Young Arab Scientists in Chemistry 2004.

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