Design of Boron Nitride Nanosheet/Polymer Electrospun Nanofibers

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Abstract

Nanofibers are widely used industrial and biomedical fields. Various synthetic or natural polymers such as polyvinyl alcohol (PVA), polyacrylic acid (PAA), chitosan, and alginate are commonly fabricated by electrospinning technique. PVA, a hydrophilic polymer, can easily produce as nanofiber by electrospinning. However, poor mechanical properties and water resistance are disadvantages of PVA [1]. Until now, PVA has been combined with different polymers and reinforcing agents to improve its properties and be used in different application areas [2]. Among polymers, gelatine, chitosan, carboxymethyl cellulose, pullulan, and PAA are widely preferred [3]. The PVA/PAA system is a well-known mixture due to its interpolymer hydrogen bond interactions and its miscibility at the molecular level. Recently, studies in biomedical field focused on the nano-sized reinforcement materials such as graphene [4], graphite, multilayer carbon nanotubes [5], and boron nitride [6] to improve weak mechanical strength, uncontrollable degradation, and insufficient biocompatibility of polymeric materials [7].
In this study, the effect of boron nitride nanosheets on the properties of biodegradable PVA/PAA nanofibers produced by electrospinning was investigated. For this purpose, boron nitride exfoliated by ultrasonication in ethanol medium. The boron nitride nanosheet reinforced-PVA/PAA composite nanofibers were produced by electrospinning at different boron nitride nanosheet ratios and annealed at 130 ^{o}C for 80 min. FTIR and SEM/EDS results determined that boron nitride nanosheets was homogeneously dispersed in the PVA/PAA nanofiber. However, it was determined that composite nanofibers were not toxic for L929 cell line and showed good antibacterial activity against to *E. coli* and *S. aureus*.

References

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