Effect of Humidity on Formation of Electrospun Polycaprolactone Nanofiber Embedded with Curcumin using Needdleless Electrospinning

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ABSTRACT

This paper presents the effect of humidity on electrospun polycaprolactone (PCL) nanofiber formation using needleless electrospinning for drug delivery application. The nanofiber was made using a NS Lab needleless electrospinning working at the applied voltage of 45 kV. Polycaprolactone in dichloromethane was the polymer used with curcumin as the embedding model drug. Morphology of the fiber was analyzed using scanning electron microscopy and the fiber size distribution was studied using Fiber Metric image analysis tool. An increase in fiber diameter from 100 nm to 145 nm was observed when the humidity factor was raised from 40 RH to 60 RH. The fibers produced are also much more uniform at 60 humidity. The model drug, curcumin was loaded into a PCL nanofiber with entrapment efficiency up to 93. The controlled release of curcumin from the scaffold under physiological simulated conditions shows a significant release of curcumin within 48 hours of test. This work may serve as a useful guide to obtain a high-quality nanofiber from needleless electrospinning process for drug delivery application.

KEYWORDS

Nanofiber, humidity, PCL-DCM, fiber size distribution, surface morphology, controlled release, curcumin