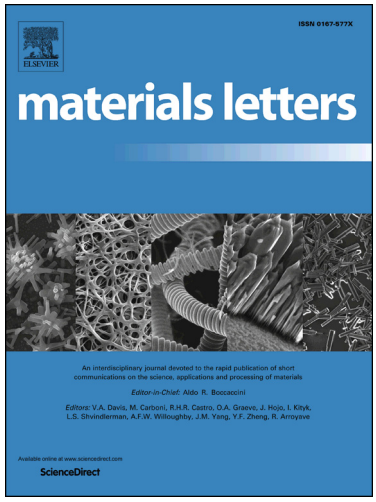

A Double-Switching Voltage: Controlling Multiple Jets in Electrospinning

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A Double-Switching Voltage: Controlling Multiple Jets in Electrospinning

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Abstract

A double-switching-voltage phenomenon was found in traditional electrospinning with an auxiliary needle electrode where multiple jets (>=2) only appeared between two threshold voltages. The effects of the double-switching voltage and other electrospinning parameters on the jet number were investigated. The number of jets increased as the increase of voltage, while the distances between the jets were found to be decreased with the increase of jet number. A possible interpretation of double-switching-voltage formation was provided according to the theoretical analysis and finite element analysis of the electric field. Our results could provide the underlying insights needed to guide the design of electrospinning with enhanced throughput.

Keywords: Electrospinning; Multi-jet; Nanofiber; Voltage

Introduction

Electrospun nanofibers have attracted increasing attention over recent decades due to their excellent properties [1]. Wide-ranging applications of nanofibers have been demonstrated in various fields [2-4]. Recently, New electrospinning techniques, such as needleless electrospinning [5, 6], roller electrospinning[7], and bubble electrospinning [8], have been introduced to improve the yield of nanofibers. Nevertheless, there are still some technological challenges, e.g., high voltage power supplies, rapid solvent evaporation, as well as high costs.

Multi-spinneret electrospinning can also be an important alternative to solve the low efficiency problem of traditional electrospinning. Reneker and Yarin [9] pointed

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