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A Review on Nano-Fiber Fabrication Methods by Near-Field Electrospinning

Author(s):
Antonio Osamu KATAGIRI Tanaka, Héctor Alán AGUIRRE Soto

ITESM Campus Monterrey
School of Engineering and Sciences

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Abstract

Faculty: Nanotechnology

School of Engineering and Sciences

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keywords: nanotechnology, nano-fiber, near-field electrospinning, NFES

1 Summary

TABLE 1.1: Electrospun Polymer Solutions - Solution and Process Parameters

Polymer	Solvent	NFES Variant	Polymer Solution and Process Properties	Fiber Characterization	Reference
Poly(ethylene oxide) (PEO)	Deionized water	Low-Voltage and Low-Electrical Field NFES	• PEO Concentration: 1, 2, and 3 $wt\%$ • Rise in solution conductivity with the increase in PEO concentration • Solution Stirring: 24 h of free diffusion followed by 96 h of stirring at 30 rpm • 3 mL syringe • 27 gauge type 304 stainless steel needle • Solution deposition rate: lower than 1 $\mu L/h$ • needle-to-collector distance: 1 mm	• Diameter: 50-425 nm	[1]

TABLE 1.2: Electrospun Polymer Solutions - Solution and Process Parameters

Polymer	Solvent	NFES Variant	Polymer Solution and Process Properties	Fiber Characterization	Reference
			• NFES process initiated by an air interference with a glass microprobe tip (1 to 3 μm tip diameter) to overcome the surface tension • Time to produce a stable continuous jet: 45 min • Polymer jet initiated at 400-600 V and dispensed at 200-400 V • Collector linear speed: 10-40 mm/s • The voltage turned on when the solution formed a full-sized droplet of 500 μm diameter at the needle tip.		[1]
Poly[2-methoxy-5-(2-ethylhexyloxy)-1,4-phenylenevinylene] (MEH-PPV) with Poly(ethylene oxide) (PEO)	acetonitrile / toluene mixture (65 / 35) or acetic acid / toluene (17 / 83) or pure toluene		• Concentrations: – 250 mg of PEO in 3.5 mL of acetonitrile / toluene – 250 mg of PEO in 3 mL of acetic acid / toluene – 10 mg of MEH-PPV in 2 mL of toluene		[2]

TABLE 1.3: Electrospun Polymer Solutions - Solution and Process Parameters

Polymer	Solvent	NFES Variant	Polymer Solution and Process Properties	Fiber Characterization	Reference
					[3]
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