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Morphology control of micro-fibers/particles via a non-solvent-based approach during electrohydrodynamic process

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Micro-Fibers (MFs) and Micro-Particles (MPs) with desirable porous structures are critical in drug delivery. In this study, surface morphologies of MFs and MPs were varied via non-solvent-based during electrohydrodynamic process. One-step control of fiber diameter and morphology is demonstrated using three liquids (ethanol, dimethyl silicone oil and mineral oil) serving as the non-solvent outer-flowing medium during the coaxial process. Poly-Capro Lactone (PCL) fibers with various surface morphologies (porous, rough and smooth) were prepared. The results clearly show the modified enveloping liquid coaxial Electro Spinning (ES) approach, permits fiber size regulation, hydrophobic enhancement and surface topography. Furthermore, non-solvent collection medium was used to generate porous particles hosting drug (indomethacin) and magnetic Fe_3O_4 Nano Particles (NPs) in single-step electro spraying technique. *In vitro* drug release analysis for both porous and solid (non-porous) particle systems demonstrated a short drug burst period followed by a prolonged phase of dissolutive drug release, which is based on Fickian diffusion. Subsequently, with external alternating magnetic fields (AMF, 40 kHz), the release rate of drug from drug-magnetic porous microspheres was characterized, facilitating drug release over the established Fickian process. This work indicates a versatile and efficient method for preparing porous materials via non-solvent-based approach, which further enables controlled surface hydrophobic property and drug release kinetics of the fabricated drug carriers.

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