

Free Surface Electrospinning of Microemulsions Containing Vitamin E

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Abstract — Free surface electrospinning (FSE) of microemulsions is a novel method proposed to increase solubility of poorly soluble active pharmaceutical ingredients (API) and to eliminate batch powder processes that challenge the pharmaceutical industry today. An oil-in-water (o/w) microemulsion containing vitamin E, EL-35 surfactant (castor oil), ethyl butyrate, water and ethanol was investigated. Turbidity of the microemulsion was measured at varied stir time and sonication time to determine its stability. The five-component microemulsion stabilized at 1 hour stir time and 45 seconds sonication time. Polyethylene glycol (PEG) and polyvinylpyrrolidone (PVP) were used to create the medium for electrospinning. A ratio of 9 wt. % PEG and 6 wt. % PVP relative to the aqueous phase was found to be the effective ratio that produces high quality desirable mats. Scanning electron microscopy (SEM) confirmed uniformity and amorphicity of the fibers. The role of EL-35 surfactant and the release characteristics of nanofibrous mats were also examined using high performance liquid chromatography (HPLC). Dissolution of fiber mats containing vitamin E in acetate buffer solution reached 100% within 10 minutes indicating a high release rate when EL-35 served as the surfactant. Moreover, the mats showed higher release characteristics compared to casted film emulsions. Productivity of FSE was found to be 0.26 mg/min per centimeter of electrode length, significantly higher than conventional needle based electrospinning.