



Budapest University of Technology and Economics
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Innovation and new technologies for pharmaceutical biotechnology

Summary of Ph.D. dissertation

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The aim of this work was to develop new, innovative technologies in the field of pharmaceutical biotechnology to make the manufacturing processes more economical, safer, and to ensure good product quality. The application of Raman spectroscopy as a PAT tool was investigated to monitor and control the enzymatic hydrolysis of lactose, ethanol production by yeast fermentation, and a monoclonal antibody producing mammalian cell cultivation. Multivariate data analysis was used for the real-time evaluation of Raman spectra, which enabled the feedback control of the critical parameters (e.g. glucose concentration). PAT technologies can ensure good product quality and stability during production, however it is also important to maintain stability during formulation and storage. For this purpose, electrospinning was chosen as a gentle drying technology. Aqueous solutions containing polyvinyl alcohol, polyethylene oxide and sugar (e.g. mannitol) was electrospun producing grindable nano-scale fibers, which can be used for the formulation of biomolecules. In order to satisfy the industrial requirements, the scale-up of electrospinning was accomplished using high-speed electrospinning equipment. Furthermore, the advantages of electrospinning were tested during the preparation of three-dimensional scaffolds from biocompatible polymers, such as polycaprolactone, poly(lactic acid), poly(lactide-co-glycolide), poly(lactide-co-caprolactone), and poly(hydroxybutyrate-co-hydroxy valerate).