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Full factorial design optimization of anti-inflammatory drug release by PCL–PEG–PCL microspheres

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Abstract

A biodegradable triblock poly (ℓ-caprolactone)–poly (ethylene glycol)–poly (ℓ-caprolactone), denoted PCEC, copolymer was successfully synthesized by ring-opening polymerization of ℓ-caprolactone, and was characterized by intrinsic viscosimetry, 1H nuclear magnetic resonance, infrared spectroscopy and X-ray diffraction. Copolymer micro particles loaded with ibuprofen were prepared by an oil-in-water (o/w) emulsion solvent evaporation process. They were carefully weighted and characterized through their zeta potential. In this work, four selected process parameters (shaking speed, time of contact, poly (vinyl alcohol) concentration, and ibuprofen concentration) were adjusted at two different values. For each of the sixteen experimental conditions, repeated twice, the drug encapsulation efficiency of the microspheres was determined. A two level full factorial design method was applied to evaluate the effect of the four factors on the observed responses (encapsulation efficiency) and to determine the optimal conditions for the microencapsulation of the ibuprofen through an accurate statistical protocol. The JMP 7 software (from SAS institute at Cary, NC, USA) was applied for analyze all the results and optimize the experimental conditions. The results showed that the ibuprofen concentration and the shaking speed had a great influence on encapsulation efficiency. The interaction plots of the four selected factors were also studied, and the results showed that a significant interaction is observed between shaking speed vs. IBF concentration, and between PVA concentrations vs. IBF concentration. According to the electron micrographs the PCEC micro particles obtained exhibit a spherical shape as shown by electron microscopy. The mean diameter of the microspheres ranged from 90 to 236 µm. Finally, PCL based copolymers has a great interest in the field of microencapsulation of hydrophobic drug such as ibuprofen..

Biography

L'Hachemi AZOUZ was born on February 25, 1983 in Bejaia. He holds a doctorate degree in chemistry option chemistry and environment at Abderrahmane Mira – Bejaia University (Algeria). Currently teach as a research professor at the same university. I work on the development of biodegradable polymers of therapeutic interest. I participated in many national and international seminars. I am author of two publications in two renowned international journals.

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