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Effect of ultrasound on the physico-chemical properties of poorly soluble drugs: Antisolvent sonocrystallization of ketoprofen

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Abstract

In the present study, power ultrasound (US) using the antisolvent sonocrystallization technique (ASC) was used to improve the physicochemical properties of ketoprofen which a poorly water-soluble drug. The powders produced were characterized by Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectrophotometry (FTIR), Differential Scanning Calorimetry (DSC) and X-ray Diffraction (XRD). The effect of process variables on particle size, solubility and dissolution were studied. Flowability, compressibility and mechanical properties of the produced powders were also assessed. Using ASC led to considerable decrease in the particle size. SEM studies showed that the ASC produced particles were almost spherical with regular size. Thermal behavior, XRD patterns and FT-IR spectra of raw ketoprofen and powders obtained by ASC have shown no significant differences. Although the solubility of the produced powders in HCl (pH=1.2, 37°C) was not increased, the rate and extent of dissolution were enhanced significantly. While process parameters were not significantly affected dissolution profile due to particle agglomeration. On the other hand, flowability and compressibility were improved. In conclusion, antisolvent sonocrystallization (ASC) technique was successfully developed for engineering small particles of ketoprofen with drug concentration of 100 mg/ml, US amplitude of 75% for 5 min in acetone at 25°C.

Keywords: Antisolvent sonocrystallization, Ketoprofen, Physico-chemical properties, Dissolution.

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