A A Alwati et al., J Pharm Drug Deliv Res 2017, 6:3 (Suppl)
http://dx.doi.org/10.4172/2325-9604.C1.018

Ultrasound-assisted compression of Paracetamol

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Aim: The objective of this work was to use high power ultrasound to overcome compression problems of Paracetamol. Paracetamol form I is used widely in the pharmaceutical industry. However, it has poor compaction properties and low plasticity. Ultrasound-assisted direct compression for the compression of powders is a novel technique.

Materials & Methods: A mixture of Paracetamol (PAR) and poly ethylene glycol (PEG) 8000 were subjected to ultrasound irradiation using an ultrasound probe system with a constant frequency of 20 KHz (MF-1200 AArc Ultrasonics). The premixed Paracetamol with 5 and 10% PEG 8000 and powder mix was poured into the static cell. The ultrasound energy was applied using a ultrasound horn at room temperature and using different exposure times. The tablets were characterized using Differential Scanning Calorimetry (DSC), powder X-ray diffraction (PXRD), hardness test and a dissolution study.

Results & Discussion: PXRD of all ultrasonicated Paracetamol samples exhibited the characteristic peaks of form I Paracetamol which confirmed no polymorphic transformation was induced by the ultrasound. The tablet obtained from a longer exposure time had a prolonged drug release profile. Thickness was constant and harness was improved with increase of exposure time as a result of strong bond between PEG molecules and Paracetamol molecules.

Conclusions: The study demonstrates that ultrasonic energy can be used as an alternative energy source for obtaining tablets with low compressibility drugs, such as Paracetamol, without using direct compression techniques. Ultrasonic power, % of added PEG 8000 and exposure times were crucial parameters in the synthesis of Paracetamol tablet.

Biography

Abdolati has been awarded B.Pharmacy degree from the Faculty of Pharmacy, Tripoli University, Libya in 2001. He has also gained a Diploma in Genetic Engineering (real-time PCR) from Chalmer University in Sweden in 2003. He has experience of working in Quality Control Drug Center in Libya in the inspection department from 2004-2007. Also, he has been awarded a Master Degree in Pharmaceutical Services and Medicines Control from Bradford University in 2010. He has recently joined The Centre for Pharmaceutical Engineering Science in 2012. His research project is related to pharmaceutical processing and crystallisation using Ultrasound and Hot Melt Extrusion. His supervisors are Dr Adrian Kelly and Prof. Anant Paradkar.

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