O3

Microtomography imaging as a characterization tool for solid dosage forms

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The purpose of this study was to evaluate the suitability of microtomography (microCT) imaging as a characterization tool for solid dosage forms. In this context tablets and pellets were investigated, because they represent different sample sizes. It is well known that the characterization of inner microstructure of a tablet has suffered from the lack of non-destructive methods and in the case of smaller samples, such as pellets, inner microstructure analysis can be even more challenging. By using microCT imaging it was possible to visualize and measure three-dimensional object structures non-destructively, but the utility depends on resolution requirements for the object structure in focus. Quantitative analysis of microstructures is meaningful only when the resolution is sufficient. Based on the principles of microCT imaging and sample size, a sufficient resolution was less laborous to get for pellets than for tablets. The resolution obtained was also good enough for quantitative analysis.

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O4

Investigation of porosity of tablets using photoacoustic spectroscopy (PAS)

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Tablet porosity strongly affects pharmaceutical and biopharmaceutical properties of the tablet. The present aim was to develop a novel non-destructive porosity measurement technique for tablets using photoacoustic spectroscopy (PAS) method. The porosity of starch acetate flat-faced tablets was calculated from the true density, determined by helium pycnometry, and tablet density, based on tablet dimensions and weight. The sample set comprised of 18 tablets whose porosity varied from 14 to 40%. The photoacoustic spectra were measured using a FT-IR spectrometer equipped with a PAS accessory. The step-scan mode with 100 Hz modulation frequency and a wide wavenumber range was used. The resulting amplitude and phase spectra show clear trends with respect to the tablet porosity. The relative porosity prediction error for one tablet, using the 17 others as the calibration set, was of order 1%. In conclusion, the results demonstrate that PAS is a potential method for tablet porosity measurements.

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O5

Dissolution monitoring of hydrophilic matrix tablets by using frequency information of ultrasound echo

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The swelling and erosion front propagation is related to the release mechanisms for hydrophilic gelling matrix tablets (Colombo et al., 1996) and is therefore studied quite intensively. In pharmaceutical research the objective is to identify methods for quantitative and qualitative analysis of erosion and swelling fronts. In this study, a novel frequency of ultrasound echo (FUSE) technique was developed. The pulsed ultrasound echoes were recorded during spatial scan along dissolving hydrophilic polymer matrix tablets and the frequency spectrum of detected echoes was determined. The dissolution process of three different polymers, commonly used in pharmaceuticals, was monitored. Hydroxypropylmethylcellulose (HPMC) and two polyethyleneoxide (PEO) polymers with different polymer chain structures were used as tablet matrices. According to the measurements, the technique can be used for quantitative analysis of dissolution process monitoring of hydrophilic matrix polymer tablets. Strong correlation ($r > 0.9$) between tablet gel layer thickness determined by optical reference method and FUSE was found.

Reference

Colombo, P., et al., 1996. J. Control. Rel. 39, 231.

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O6

Drugs release from hydrodynamically balanced systems analyzed with data-mining procedures by artificial neural networks

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The aim of this work was to identify relationships between drugs release from hydrodynamically balanced systems (HBS) and the formulation composition. Artificial neural networks (ANNs) were applied as data analysis tools. Model drugs chosen were: poorly water soluble (ketoprofen) and water soluble drug (L-dopa). Three types of polymers: cellulose derivatives, alginates and carrageens were used to prepare HBS matrices. There were 70 formulations included in the database. The polymeric matrices were encoded with use of cheminformatics software: GAMESS-US, Dragon, MMPro and EPI, giving around 2500 of initial governing variables. Forty thousand (40,000) ANNs were trained and reviewed to predict particular drug release based on the quantitative and qualitative composition of formulation. Separate modeling procedures were