Poster Presentation

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Characterising amorphous pharmaceuticals using PDF methods

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The high free energy and low density of the amorphous phase mean that amorphous pharmaceutical compounds typically dissolve faster than their crystalline forms. However, the metastable nature and propensity to crystallise during formulation and storage are serious concerns for drug developers. Faster dissolution is associated with greater bioavailability and, hence, amorphous drug formulations provide intriguing possibilities in the pharmaceutical industry. The understanding of these systems is complicated due to the significant positional and orientational disorder of the molecules and the lack of long-range periodicity. This lack of periodicity prohibits the use of traditional crystallographic techniques as a means of determining their structure. Because pair distribution function (PDF) methods can be used to study not only to the long-range structure of a material but also its local structure, the technique can be used to probe the short-range interactions present in amorphous formulations, despite the large amount of disorder present.

Multivariate analysis of PDF data collected using a laboratory X-ray diffractometer has been used to characterise sets of systems with different levels of disorder. Included is a series of drug formulations containing amorphous felodipine, a calcium antagonist, in a copovidone polymer binder with different drug loading levels. Reverse Monte Carlo methods have also been used to model the packing of disordered molecular solids and are being applied to study the packing of drug molecules in amorphous solid dispersions.

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