Description and interpretation of anisotropic behaviour of pharmaceutical tablets

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ABSTRACT

Attrition and breakage of pharmaceutical tablets is one of the major problems faced by pharmaceutical industry during manufacturing and transportation processes. Although these phenomena has been investigated and described before[1,2], none of the published works has considered the anisotropic behaviour of tablets as a consequence of the compaction process parameters (e. g., die height, compression speed) or internal formulation (brittleness of main excipients or lubricant content). Most of the existing techniques are simply discrete procedures (passing or not passing) or merely focused on description of superficial parameters.

The aim of this work is to establish a systematic characterization of anisotropies in tablets studying the effects of excipient formulation, as well as compaction conditions. To accomplish that, a series of cylindrical tablets of microcrystalline cellulose (MCC) and crystalline lactose (LAC) with a variable content of lubricant (Magnesium stearate) has been produced. Firstly, a non-destructive study with X-ray tomography has been carried out in order to determine the volumetric changes in porosity, particle arrangement and coordination number. Secondly, a breakage test with a non-confined test and a hardness test by means of micro-indentation have provided information regarding the anisotropic mechanical behaviour, i.e. the differences between axial and radial tablet properties in axial and radial direction. Concurrently, the influence of fatigue after a certain number of impacts in internal strength and on disposition of tablets after a certain number of impacts has been studied.

All information compiled during these three steps could convey into a powerful tool for a better description of internal particle arrangement changes in DEM simulation.

REFERENCES

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