SM15L_12917

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

# Experimental Characterisation and Numerical Modelling of Density Distribution in Tablets

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Density gradients in pharmaceutical tablets are important for they affect the local properties of the material which in turn influence the mechanical response of the tablet during post-compaction operations, such as coating, packaging, transport, storage or use. Experimental density maps obtained using techniques such as indentation hardness and X-ray computed tomography (CT) are presented. Constitutive models have been developed and calibrated to describe the compaction behaviour of the powder and the friction interaction between powder and die wall. The results are implemented in the finite element program ABAQUS/Standard. It is shown that different die wall lubrication conditions induce opposite density distribution trends in identical tablets (weight, height and material) and this affects the break force, failure mode and friability: it is then demonstrated that for a given average tablet density the break force and failure mode are not unique. The methodologies presented are applicable for any powder system in general.

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