Conference abstract PMS39

Evaluation of Binding Agent's Effect on the Compressibility of Poorly Compactable Drugs

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Sci Pharm. 2010; 78: 666 doi:10.3797/scipharm.cespt.8.PMS39

The compression during tabletting is a complex and irreversible dynamic process and the study of it with instrumented tablet presses is beneficial for process and formulation optimization. The compaction and ejection cycle provides us suitable signals about the tabletting process. Instrumented presses used in tabletting research and development are normally equipped to measure punch force and displacement [1]. By measuring the compression force both of the upper and the lower punch and the displacement of the upper punch force as a function of time and as a function of displacement can be analyzed. Moreover, several energy parameters, such as the lubrication of the tablets and the occurred friction during the compaction can be calculated from these data concerning for example to the binding characteristics of the applied excipients [2, 3].

The aim of our work was to investigate the effect of pharmaceutical excipients and process parameters on the tabletting properties of poorly compactable drugs analyzing the force-displacement profile of drug-excipient systems recorded by tablet press instrumentation. Furthermore with matching the forces measured on the upper and lower punches various parameters of the compaction – lubrication, friction coming up during tabletting – were calculated as well. A 3^2-type face centered full factorial design was applied to study the energy parameters as response variables (Y) and surface plot was made which is to describe with the following equation:

$$Y = a + b\,X_1 + c\,X_2 + d\,X_1^2 + e\,X_2^2 + f\,X_1X_2$$

where according to the polynomial terms the effect of each independent variables (b, c), their linearity (d, e) and the interaction between them (f) are described. The force-time curves are useful indicators of the compaction behavior regarding elasticity and plasticity. In addition, studies on compression profiles may serve as fingerprints for tablet compositions.

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