Roll Compaction/ Dry Granulation of Pharmaceutical Excipients: Case Study Magnesium Carbonate

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The combination of roll compaction/ dry granulation is a solvent free process for particle enlargement. Roll compaction/ dry granulation are of growing importance in pharmaceutical sciences as well as in the pharmaceutical industry due to improved machine technology and process control. A short introduction into the process and the process control will be the first part of the lecture.

Dry granules are usually intermediate products for the manufacture of tablets. The dry granulation process can modify the tabletability of pharmaceutical excipients. Magnesium carbonate is taken as an example for an inorganic material, which can be dry granulated alone or co-processed with other excipients. For one type of magnesium carbonate the effect of roll compaction/ dry granulation on the particle properties and the tablet properties will be shown in detail. While the coherent powder is converted into free flowing granules, a partial loss of compactibility can be observed at the same time. These effects are more pronounced by using high compaction forces.

The comparison of four different types of magnesium carbonate reveals a marked influence of the starting material on the properties of the granules and the subsequent tablets. Using the degree of densification as a parameter to describe the change in density during tableting, the tensile strength of tablets could be described consistently for all four types of magnesium carbonate. Measurements of the microhardness of the ribbons after roll compaction support the other findings. However, the tablets failed the acceptance criteria of the Ph.Eur. A high friability, capping of tablets or an insufficient tensile strength was observed for all tablets. The four types of magnesium carbonate are compared and one type is selected for further studies.

For a co-processing with a second excipient, several commonly used binders have been studied. Powdered cellulose was selected for further studies. The co-processed granules showed superior flowability, but inferior compactibility compared to physical mixtures. The mixtures were varied with respect of the type and the amount of powdered cellulose. Tablets according to the Ph.Eur. can be produced by adding only 5% of powdered cellulose, using a low compaction force and a high tableting pressure. From the case study recommendations for the selection of the starting materials and the appropriate process parameters can be derived in order to produce a co-processed excipient with magnesium carbonate for direct compression.