# A CONTINUUM MECHANICAL MODEL FOR HOT AND COLD COMPACTION

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## ABSTRACT

Continuum mechanics is applied to the process of powder compaction in order to derive relevant model parameters for the physical processes during compaction. The investigation contains both experimental and analytical treatments of model systems.

Three experiments have been performed on plate models compressed under plane strain conditions. Plates of lead were made with different void (particle) geometries. One experiment shows that in the initial stage the small particles deform heavily. It is also found that the pore shape is rather constant at low porosities. Strong interaction between differently sized pores is shown. Small pores deform more than large pores in contrast to currently accepted ideas.

A model system for precompacted powder is analysed by FEM using an elastic-plastic, plane strain program. Deformation behaviour is in agreement with the results from the corresponding plate experiment. Porosity-pressure curves from the calculations are also in reasonable agreement with experiments on hot and cold compaction.

In the past, oversimplified models have been suggested which neglected the condition of compatibility. This oversimplification is found to give misleading results. A two stage mechanism is proposed for description of the compaction process. At high porosities the densification can be described by particle deformation, at low porosities by pore closure. In the transition region a more complex description will be required.