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V&V Concepts in Developing a Class of Finite Deformation Pressure Dependent Plasticity Models Validated by Experimental Observations

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ABSTRACT

In the present talk we address the steps carried out toward a reliable finite element simulation, of cold isostatic pressing (CIP) process of metal powders. The foundation is a plastic constitutive model for finite deformation, of particular powder metals. The constitutive model developed on the basis of experimental observations [1]. Subsequently the constitutive model incorporated both into a p-FEM implicit academic code – AdhoC, and into a commercial h-FE explicit code - HKS/Abaqus/Explicit. The proposed constitutive model contains several material parameters and evolving internal variables. Those material parameters and variables identified by a set of relatively simple, uni-axial die compaction experiments. The identified parameters were then applied for the simulation of CIP processes in both FE codes.

Next, experimental observations of a CIP process of relatively complex geometries were performed. In parallel simulations were used to validate the overall method by comparing the FE results (final dimensions and average relative density) to the experimental observations.

The excellent results obtained by p-FEM and h-FEM simulations, in comparison to experiments will be presented [2-4].

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