

## A NEW BINDER SYSTEM FOR POWDER INJECTION MOLDING

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### ABSTRACT

A critical problem in the powder injection molding process arises from distortion or slumping of the molded parts during debinding. One approach to solving this problem is to develop a binder, which can be debound from the molded parts while the binder stays rigid. A new binder system, to be called solid polymer solution, was developed as a solution to this problem. A solid polymer solution is made of a major fraction of a low molecular weight solid chemical and a minor fraction of at least one high molecular weight polymer dissolved in the chemical. Several polymer solutions were successfully used as binders for various powders including iron, stainless steel, alumina and silicon carbide. The molded parts were easily debound without any distortion of the parts by solvent leaching or sublimation at a temperature below the melting point of the chemical. Shape retention during debinding and sintering was excellent.

### INTRODUCTION

In the conventional powder (press & sinter) process, metal powders are compacted at a very high pressure into a desired shape and the compact is sintered in a furnace to manufacture the product. The inherent problem in this process arises from the fact that the applied pressure to the compact decreases quickly away from the surface of the compact due to the friction between the powder particles. Therefore, the density of the compact varies throughout the compact, resulting in nonuniform shrinkage of the compact upon sintering. Complex shapes are difficult to make by the conventional powder process.

The powder injection molding process (PIM) has become an important new technology in recent years for processing metal and ceramic powders.