

A Case Study for a Complex Shaped Part made by  
Powder Injection Molding of a  
Tungsten Heavy Alloy

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### ABSTRACT

Complex parts of tungsten heavy alloy can be produced by machining of semi-finished materials. For applications which need complex shaped parts in larger numbers machining is mostly not affordable. The powder injection molding of Tungsten heavy metal is an appropriate process to manufacture a larger number of complex parts. As an example part a 105 g radiation shielding of WFeNi with 93% tungsten was produced by PIM. A well understood polymer-wax binder concept was chosen to ensure proper injection molding and debinding properties. In order to keep tolerances and to obtain density of the produced component most development efforts had to be focused on the sintering process.

### INTRODUCTION

During the last decade, Powder Injection Molding (PIM) [1] has become an attractive manufacturing process for mass production of complex shaped parts. So far, the expansion of the PIM process has been based on and restricted to applications of small specific, mostly stainless steel parts in automotive components, office machines, small gun part, etc. However, the potential for which the PIM technology stands out from competing manufacturing technologies in regard of the material, is not yet exhausted. This paper presents the development of a WFeNi part for a medical application and shows that especially for high performance, expensive materials the PIM technology is a valuable way to manufacture complex shape parts.

### PROCESS OVERVIEW

For PIM the metal powder has to be mixed with an organic binder. The binder usually consists of different components. In the case of this work, a well-known binder concept of different waxes