A NEW FURNACE CONCEPT BASED ON PLASMA TECHNOLOGY FOR PROCESSING PIM COMPONENTS

P. A. P. Wendhausen, J. L. R. Muzart, A. R. de Souza, M. C. Fredel, A. N. Klein, N. Back, L. A. Mendes
Universidade Federal de Santa Catarina, Laboratório de Materiais - labMAT
CP. 476 Campus Universitário, 88040-900 Florianópolis, SC - Brazil
Phone +55-48-3319268, email paulo@materiais.ufsc.br

W. Ristow Jr., P. Alba, V. A. Pedroni
Lupatech S.A. Division SteelInject C.P. 1215
95112-090 Caxias do Sul, RS – Brazil

ABSTRACT

The research and development of a new furnace for processing injection molded metal parts based on plasma technology is reported. Some preliminary results show that the system allows the incorporation of debinding into the sintering cycle with advantages regarding energy savings, gas consumption and processing time. The reactor chamber does not have any resistive elements for heating and therefore problems with internal contamination are not as relevant as in the case of conventional vacuum furnaces. Additionally, heating is more uniform since each component or support tray can be heated individually by the collision of plasma species. It is also observed that the elimination of debinding residues like carbon is improved by active plasma species, like atomic hydrogen, for they are more reactive than gas molecules of conventional atmospheres.

INTRODUCTION

The Powder Injection Molding (PIM) technology was developed to allow the manufacturing of small, complex, high-precision metallic and ceramic parts with high quality and at a lower cost than conventional processes. By using metallic and ceramic powders, mixed with appropriate organic binders, PIM transfers to the ceramic and metallic worlds the flexibility, ease of use, and relatively low cost of *plastic* injection molding [1],[2]. Among some of the restrictions to a more widespread use of this technology is the long processing time to get a finished product. One of the crucial steps of the PIM process is the debinding phase, which consists of removing the organic binder from the parts once they have been molded. The need to carefully extract the binder without disruption of the particles is one of the reasons of such long processing times and therefore shortening of debinding time is a major concern regarding PIM competitiveness.

Different debinding techniques have been developed to overcome the above mentioned problems, most of them based on solvent or thermal processes [1]-[7]. For thermal debinding in a conventional batch type reactor, the green parts are often placed on a tray and loaded into the reactor chamber, which is usually a solid steel retort [2]. Since the binder systems commonly used are made up of