

A COMPARATIVE STUDY OF DELUBRICATION AND ASSOCIATED DEFECTS FOR HIGH TEMPERATURE SINTERED FERROUS MATERIALS

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Abstract

In this study, the process of lubricant removal for high temperature sintering alloys in H_2-N_2 furnace atmospheres was examined. The lubricants studied included (A) zinc stearate; (B) a synthetic wax; (C) a combination of (A) and (B); and (D) an alternative to (A), (B), and (C) which contains a metallic component. Two types of specimens were utilized. The first set consisted of pellets of as-received lubricant. The second set was transverse rupture strength (TRS) specimens of a high temperature sintering alloy containing these lubricants. Reaction rates and the effect of temperature and gas velocity were measured. The formation of part defects due to delubrication is discussed with localized carburization/melting highlighted. A mathematical model of the TRS specimen experimental system is presented. The model predicts carbon sooting and the occurrence of localized melting defects during high temperature sintering.

Introduction

As production rates, sintering temperatures, densities, size and complexity of powder metallurgical parts increase, so does the need to adopt predictive process control measures. An important step in the processing route that can benefit from accurate control is delubrication.

To achieve optimal delubrication, it is necessary to determine the mechanisms of defect formation due to the lubricant removal process, measure the rates of reactions associated with lubricant removal, and determine the effect of furnace process variables on both lubricant removal and defect formation. Once these parameters are established, mathematical modelling can be employed to predict the occurrence of part defects and identify measures to eliminate them.

The process of removing lubricants from parts has been formerly investigated [1-14]. In a previous study, the mechanisms of part defect formation and relevant process parameters for zinc stearate removal in H_2-N_2 atmospheres were established [14]. Zinc stearate delubrication is