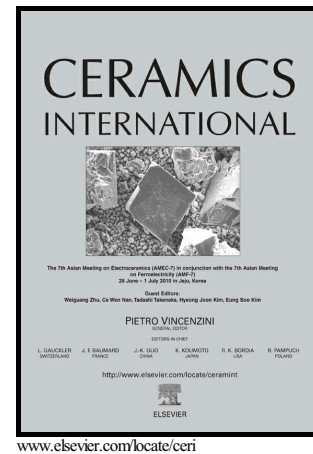


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Mold filling simulation of low pressure injection molding (LPIM) of alumina: Effect of temperature and pressure

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Abstract

Filling stage is the most important stage in powder injection molding (PIM) process so that many defects may occur in this stage. In the present study, filling stage for low pressure injection molding (LPIM) of alumina was simulated by finite element method (FEM). Experimental tests were conducted on alumina feedstock with 60 vol. % powder. Feedstock properties such as rheological property, specific heat and thermal conductivity were measured. The simulation results were validated with experimental tests carried out at temperatures and pressures of 70-100 °C and 0.1-0.6 MPa respectively. In addition, injection molding experiments involving short shot tests were performed to track melt front advancement pattern. The melt front shape obtained from the simulation matched the experiments well in top view but was slightly different in side view. Comparison between simulation and experimental results showed good agreement with regard to the melt front locations. Simulation have been found to correctly describe trends such as an increase in the pressure required to fill molds as temperature decrease.

Keywords: Alumina, Low- pressure injection molding, Mold filling simulation, Rheological properties

1-Introduction

Powder Injection molding (PIM) is a shaping method for the mass production of parts with complex shapes from metal and ceramic powders [1]. Two different method of powder injection molding exist, high-pressure injection molding (HPIM) which used widely in the industries and the less common low-pressure injection molding (LPIM) [2]. LPIM is a variant of injection molding, where lower temperatures (60-70 °C) and much lower pressures (<0.7

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