International Review of Mechanical Engineering, vol. 7(7), 2013, pages 1378-1383

The effect of shear rate and temperature on rheology properties of magnesium metal injection molding feedstock

Abstract

Metal injection molding (MIM) becomes a well-established and promising technology for small and mass production. Feedstock characterization is one of the most important roles in ensuring the properties of the MIM products. Rheology study is compulsory in characterize the feedstock for matches the range of viscosities encountered in practice. The shear rates for molding normally exceed the range obtainable with the rheometer. In this study, the rheological properties and behaviors of magnesium metal injection molding feedstock was investigated. The paraffin wax (PW), high-density polyethylene (HDPE), and stearic acid (SA) were used as the binder for magnesium MIM feedstock. A Brabender Plastogram EC PLUS was used to prepare the magnesium MIM feedstock, and the rheological properties of the resulting feedstock were evaluated by the capillary rheometry. The effect of the relation of shear rate and temperature on viscosity for magnesium MIM feedstock has been investigated. The rheological results exhibited the pseudoplatic behavior. The flow behavior index (n) obtained was less than 1. The viscosity (η) of the magnesium MIM feedstock decreased with increasing shear rate (γ). The magnesium MIM feedstock viscosity also decreased with increasing temperature and found to be suitable for injection molding.

Keywords

High density polyethylene; Magnesium powder; Metal injection molding; Paraffin wax; Rheology; Stearic acid