Optimization of micro metal injection molding SS 316L for the highest green strength by using Taguchi method

Abstract:

Micro metal injection molding which is a new develop technology has attract most researcher where it becomes among the promising method in powder metallurgy research to produce small-scale intricate part at an effective process and competitive cost for mass production. Due to highly stringent characteristics of micro MIM feedstock, the study has been emphasized in investigating the optimization of highest green strength which plays an important characteristic in determining the successful of micro MIM. Stainless steel SS 316L with D50 = 5.96µm was used with composite binder, which consists of PEG, PMMA and Stearic Acid. From rheological characteristic and highly significant parameter through screening experiment, feedstock with 61.5% with several injection parameters were optimized such as injection pressure(A), injection temperature(B), mold temperature(C), injection time(D) and holding time(E). Besides that, interaction effects between injection pressure, injection temperature and mold temperature were also considered to optimize in the Taguchi’s orthogonal array. Analysis of variance (ANOVA) in terms of signal-to-noise ratio (S/N-larger is better) for green strength was also presented in this paper. Result shows that interaction between injection temperature and mold temperature(BxC) give highest significant factor followed by interaction between injection pressure and injection temperature(AxB). Single factor that also contributes to significant optimization are mold temperature(C), injection time(D) and injection pressure(A). This study shows that Taguchi method would be among the best method to solve the problem with minimum number of trials.