Perancangan, simulasi dan manufaktur green part braket ortodontik dengan metal injection molding = Design, simulation and manufacturing of green part orthodontic bracket with metal injection molding

Doloksaribu, Martin, author

Abstrak

Tesis ini meneliti mengenai persentase keterisian microcavity pada cetakan braket ortodontik dengan proses Metal Injection Molding (MIM). Braket ortodontik memiliki microcavity pada bagian sayap dan dasar (base). Berbeda dengan proses pengisian pada MIM konvensional, proses injeksi/pengisian microcavity (MIM) harus dilakukan dengan cepat. Pada penelitian ini dilakukan simulasi dan injeksi cetakan braket ortodontik dengan MIM terhadap volume feeder. Feeder 1 memiliki volume (luas penampang runner-gate) kecil dan Feeder 2 memiliki volume (luas penampang runner-gate) besar. Simulasi pada Feeder 1 menghasilkan keterisian penuh pada temperatur material 200oC. Simulasi pada Feeder 2 menghasilkan keterisian penuh pada temperatur material 190oC. Aliran material pada injeksi Feeder 1 tidak dapat mencapai gate pada temperatur material 200oC dan tekanan injeksi 1600 kgf/cm2. Aliran material dapat mencapai ujung Feeder 2 pada temperatur material 165~200oC dan tekanan injeksi 1050~1600 kgf/cm2 namun keterisian cavity produk tidak penuh. Simulasi dan eksperimen injeksi memberikan hasil yang berbeda pada keterisian microcavity. Volume feeder yang lebih besar memberikan keterisian microcavity lebih baik.

......This thesis examines the filling percentage of microcavity in orthodontic bracket molds using the Metal Injection Molding (MIM). Orthodontic brackets have microcavities on the wing and base. Unlike the conventional MIM, microcavities on the microinjection (MIM) were filled rapidly. In this study, simulation and injection of orthodontic bracket molds were carried out on the different volumes of the feeder. Feeder 1 was a small volume feeder (smaller cross-sectional area of runner and gate) and Feeder 2 is a large volume feeder (larger cross-sectional area of runner and gate). Simulations on Feeder 1 produce a complete filling at a material temperature of 200oC. Simulation on Feeder 2 produces complete filling at a material temperature of 190oC. The flow of injected material in Feeder 1 was unable to reach the gate at a material temperature of 200oC and an injection pressure of 1600 kgf/cm2. The flow of injected material in Feeder 2 was able to fill the cavity at a material temperature of 165~200oC and an injection pressure of 1050~1600 kgf/cm2 however one of wing (microcavity) was still incompletely filled. Injection simulations and experiments gave different results on the filling percentage of microcavity. A larger feeder volume provides a better filling percentage of microcavity.