

Sree Chitra Tirunal Institute for Medical Sciences and Technology Influence of stamp forming parameters on final part properties of hydroxyapatite filled ethylene vinyl acetate co-polymer composites

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ABSTRACT

Hydroxyapatite (HAP) filled ethylene vinyl acetate co-polymer (EVA) composites are potential candidates for craniofacial applications. A cost effective technique for obtaining these composites in the clinically significant forms would indeed be a landmark accomplishment. Stamp forming is one such process where the cost as well as the performance of the product strikes the right balance. Prior to the stamp forming process optimization of the composites into 3-D contours, essential for applications like cranioplasty, in this experimental study the development of a two-dimensional stamping method for processing of HAP filled EVA composite using an angle mould (90°) was carried out. Composite sheets with 40 vol.% HAP were used for this work. The sheets were heated to temperatures above the melting point of the matrix and stamp formed using a cold mould mounted in a hydraulic press. The processing conditions like the stamping temperature, time, and stamping rate, required to give high-quality right angle bends, were established. The quality of stamped forms were gauged in terms of physical appearance, shape conformance and distribution of wall thickness. It was found that the stamping temperature and velocity were the key factors which determined the quality of the stamped part. Too high temperature and stamping rate led to severe thinning and degradation of formed parts, while too low temperatures and stamping rate did not conform the composite with the mould contour. A processing window in terms of stamping velocity and stamping temperature was established.

Keywords: composite hydroxyapatite part quality polymer stamp forming.