

## Thermomechanical investigations of PEKK-HAp-CS composites

*Rupinder Singh<sup>1</sup>, Gurchetan Singh<sup>1</sup>, Jaskaran Singh<sup>1</sup>, Ranvijay Kumar<sup>1</sup>, Md Mustafizur Rahman<sup>2</sup>, Seeram Ramakrishna<sup>3</sup>*

<sup>1</sup> Department of Production Engineering, Guru Nanak Dev Engineering College, Ludhiana, India

<sup>2</sup> Faculty of Mechanical Engineering, Universiti Malaysia Pahang, Pekan, Malaysia

<sup>3</sup> Department of Mechanical Engineering, National University of Singapore, Singapore

### ABSTRACT

In this experimental study, a composite of poly-ether-ketone-ketone by reinforcement of hydroxyapatite and chitosan has been prepared for possible applications as orthopaedic scaffolds. Initially, different weight percentages of hydroxyapatite and chitosan were reinforced in the poly-ether-ketone-ketone matrix and tested for melt flow index in order to check the flowability of different compositions/proportions. Suitable compositions revealed by the melt flow index test were then taken forward for the extrusion of filament required for fused deposition modelling. For thermomechanical investigations, Taguchi-based design of experiments has been used with input variables in the extrusion process as follows: temperature, load applied and different composition/proportions. The specimens in the form of feedstock filament produced by the extrusion process were made to undergo tensile testing. The specimens were also inspected by differential scanning calorimetry and photomicrographs. Finally, the specimen showing the best performance from the thermomechanical viewpoint has been selected to extrude the filament for the fused deposition modelling process.

### KEYWORDS

Poly-ether-ketone-ketone; Hydroxyapatite; Chitosan; Thermal analysis; Fused deposition modeling

**ACKNOWLEDGEMENT**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors are thankful to SERB (File No. IMRC/AISTDF/R&D/P-10/2017) for the financial support.