

OPTIMIZATION OF PNEUMATIC EXTRUSION MACHINING METHOD PROCESS PARAMETERS ON POLY-CAPROLACTONE (PCL) MATERIAL

O.Y. Venkata Subba Reddy^{1*}, P Srikar², V. Venkatesh³, A L S Brahma Reddy⁴

¹ Assistant Professor, Mechanical Engineering, MRCET, Hyderabad, India-500010

² Professor, Mechanical Engineering, MRCET, Hyderabad, India-500010

³ Assistant Professor, Mechanical Engineering, AITSR, Kadapa, India-516126

⁴ Research scholar, Department of Metallurgical and Materials Engineering, NIT Rourkela, Odisha, India-769008

*Corresponding author

ABSTRACT

Poly-caprolactone (PCL) is a promising material for bone repair and bone replacement due to the similar inorganic components with natural bone. In this research, the poly-caprolactone (PCL) scaffolds are fabricated by pneumatic extrusion method and Scanning electron microscopy (SEM) images of the fabricated scaffolds can be done to show the interior of scaffold struts and in vitro release profiles can be done to reveal the biocompatibility of the scaffolds. To confirm the performance of the fabricated composite scaffolds for required strength of load-bearing regions of bone, the UTM tests are performed and after this the Taguchi optimization technique was applied with the concept of L9 orthogonal array to the numerical data derived from the experiments. From this it was determined that scaffold with porosity of 40%, angle of filament of 30 and 90, nozzle diameter of 0.5mm is a sophisticated design that is compatible with the structure and function of the trabecular part of the natural bone. Taken together these results indicate that PCL scaffolds can be readily fabricated by 3D printing technology and can be a possible solution as implantable material for bone tissue engineering application.

Keywords: Poly-Caprolactone (PCL) Pneumatic Extrusion Method, Scanning Electron Microscopy (SEM), Scaffold, Taguchi Optimization Technique.

