

3D Printing of Bone Scaffolds by using PLA-HAp Bio-compatible material for Bone Tissue Engineering applications

Dr. Smita Mohanty

Director & Head (Principal Scientist)

Central Institute of Petrochemicals Engineering & Technology – LARPM,
Bhubaneswar

Central Institute of Petrochemicals Engineering & Technology – Laboratory for Advanced Research in Polymeric Materials (CIPET – LARPM), Bhubaneswar was established in 1986 to provide specialized skill, quality education, and up-gradation training and to provide technology support services to plastics and allied industries. They have been working in the area such as Bio-degradable polymers, Structural composites, Nanocomposites as well as Medical Diagnostic tools.

The CIPET: LARPM lab is equipped with Office Friendly MakerBot Method X 3D printer based on FDM 3D Printing Technology. It offers a unique opportunity to research scholars for prototyping of their ideas to create innovative products. They are currently focused on healthcare 3D Printing applications including bone and tissue regeneration by developing their own biocompatible 3D printing materials.

”

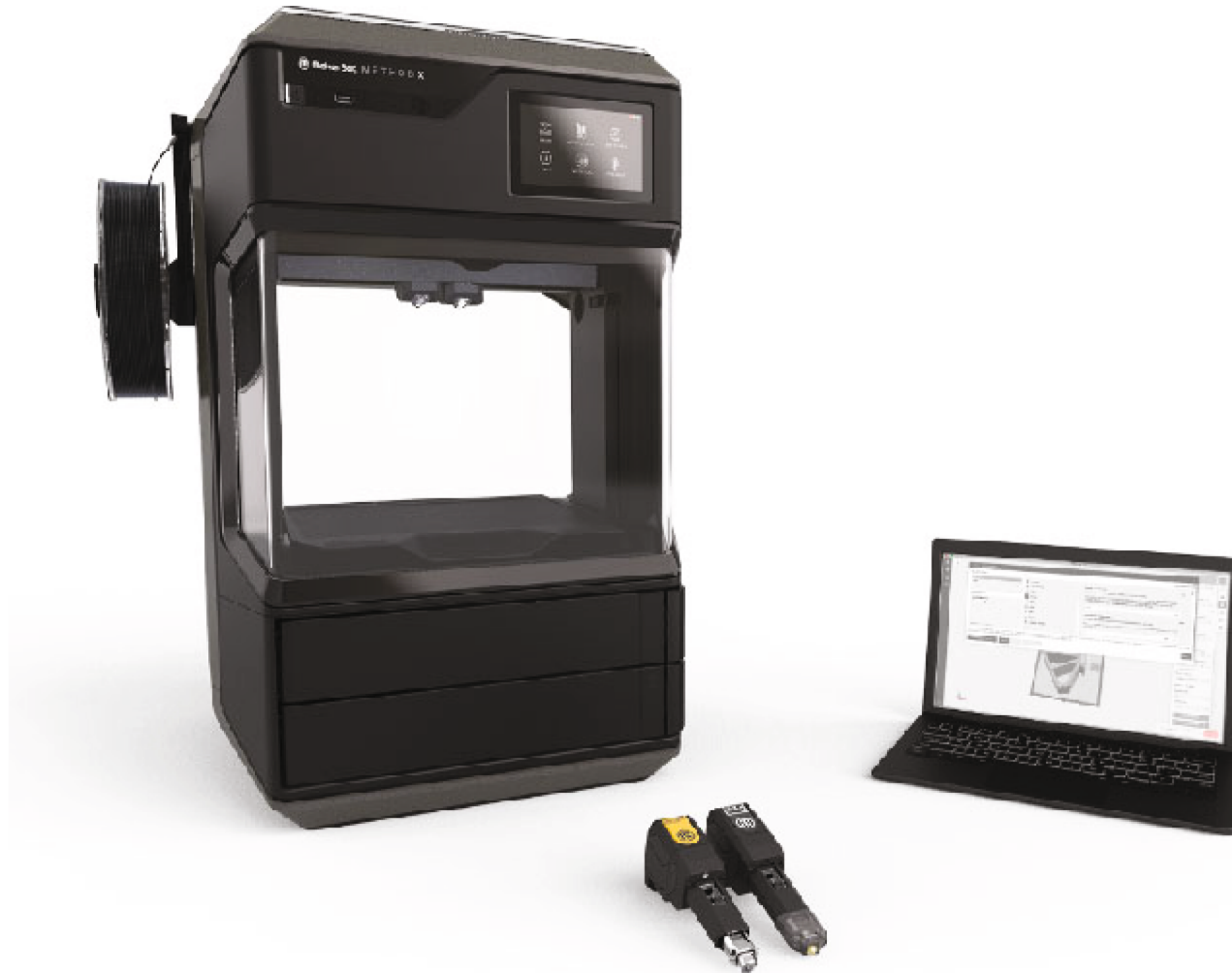
“The MakerBot method X 3D printer offers unique features as controlled chamber temperature, which enables testing and validation of self-developed materials with unique mechanical and bio-compatible properties for various research activities.”

Dr. Smita Mohanty,

Director & Head (Principal Scientist)

Central Institute of Petrochemicals Engineering & Technology – LARPM, Bhubaneswar





MakerBot Method X 3D printer at CIPET – LARPM, Bhubaneswar

Deploying FDM 3D Printing For Bioprinting Applications



Tissue Engineering aims to replace or restore damaged tissue by using artificial constructs that direct new tissue formation. Scaffolding structure is the most promising approach which would support the tissue during its growth. These Scaffolds must possess specific characteristics including biocompatibility, suitable mechanical properties, ease of sterilization, high porosity, high surface area and controllable interconnected porosity to enhance cell growth and support vascularization.

The irreversible bone defects caused by osteoporosis, bone tumor resection, and accident trauma have always been one of the significant challenges in clinical practice and created a huge demand for bone repair materials. Calcium phosphate (Ca-P), as the main inorganic component of bone, has been widely applied in the bone repair. However, its limited mechanical strength, fracture toughness, machinability, and fatigue strength had given rise to diverse problems in its applications. A large number of studies have focused on the preparation of composite biomaterials with excellent mechanical properties and bioactivity. Polylactic acid/Hydroxyapatite (PLA/HAp) composite was widely studied and applied in the field of biomaterials for its good processability, bioactivity, and mechanical properties.

In this case, the MakerBot METHOD X an office friendly open source 3D printer was engaged for PLA 3D printing, since it can print experimental and advanced filaments of 3D Printing materials (such as ABS, PC, flexible like TPU filament) in a controlled environment, enabling high precision and finish, essential for 3D printing in healthcare applications.

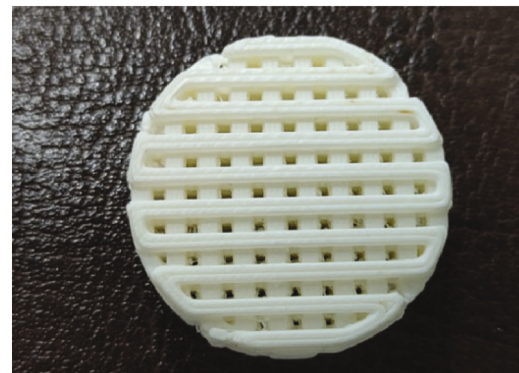
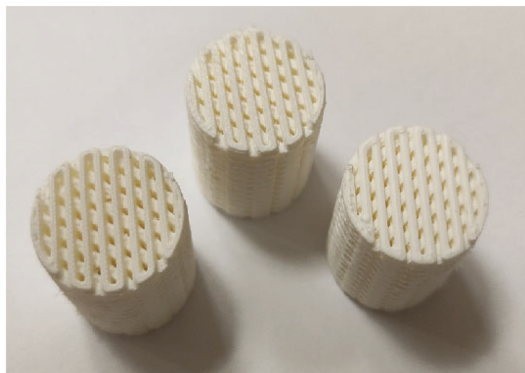
”

“The results and the quality of the finished printed parts from the machine are extremely good for conducting research activities. We were able to obtain optimal results from our self developed filament using the machine.”

Mr. Alex Yohannan,

Research Scholar

Central Institute of Petrochemicals Engineering & Technology – LARPM, Bhubaneswar



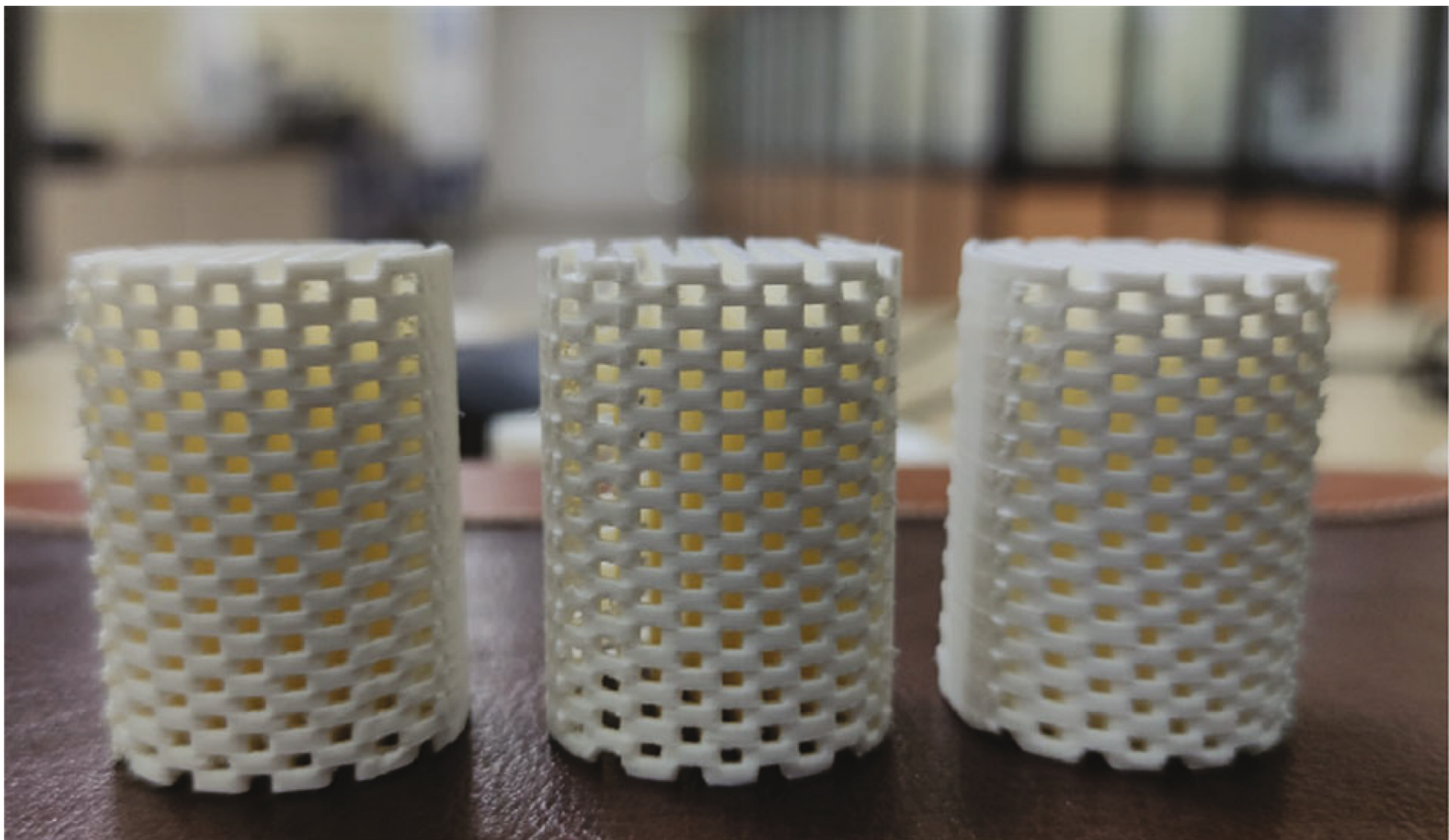
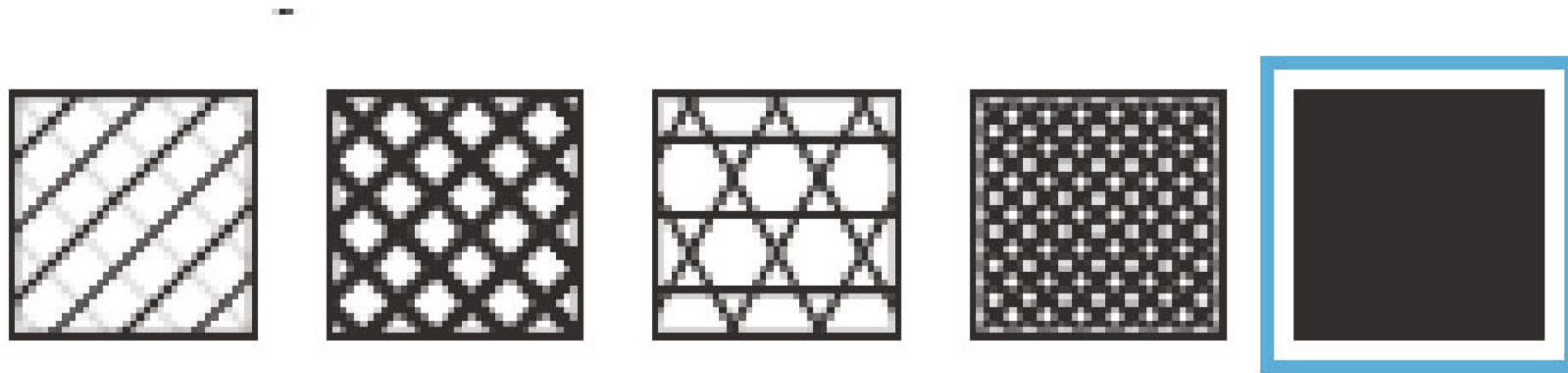


Image of 3D printed Scaffold geometry in MakerBot Method X for bone tissue engineering applications

During research or development of new applications or products, it is essential to ensure repeatability, reliability, and accuracy of experiments, this leads to the requirement of a high-performing 3D Printing machine that can serve the purpose of education and research as well as equipped enough to print a wide array of materials used in 3D printing.



MakerBot industrial 3d printer are the only desktop printers with a heated chamber being able to control the printing environment for developing and testing of new materials like TPU filament, carbon Fiber Filament. A heated chamber allows to control the temperature of the previous layer offering a better fusion between layers. A controlled environment in 3D printing improves repeatability allowing for more rigorous and accurate prints



Different Infill Style in MakerBot Print Software

This project was published on March, 2023

About Altem Technologies Pvt. Ltd

Altem Technologies is a well-established 3D digital experience company that has been actively contributing to the industry for nearly 15 years. Initially rooted in PLM software and 3D Printing, Altem has successfully transformed into a prominent provider of comprehensive 3D digital solutions. Altem's 3D Innovation platform offers an extensive array of products catering to various applications, including design, reverse engineering



process, asset digitization, prototype manufacturing, life science, healthcare, culture and heritage, and consultancy services, among others.

With a diverse clientele spanning automotive, aerospace, manufacturing, healthcare, research academia, and more, Altem adeptly addresses the unique requirements of each industry through a combination of expertise and innovation. Our team comprises skilled professionals, including Scientists, Application Engineers, Designers, domain experts, and software specialists, all working collectively to deliver exceptional solutions to our valued customers.

Altem Technologies Pvt Ltd, besides being a major provider of 3D Scanning services in India, is also a leading provider of 3D Printing Services in India with 3D Printing technologies like FDM, Polyjet, DLP, Metal, etc. Altem offers a complete solution around 3D Digitization and Innovation, and has emerged as a one-stop-shop for all 3D Printing, 3D Scanning, CAE, PLM, and Life Sciences needs, offering a wide spectrum of products for engineering and life sciences companies in India.

Get in touch

- 📞 +91-80-4150 6070 / 4153 9734
- ✉ enquiry@altem.com
- 🌐 www.altem.com



<https://altem.com/contact/>

