

Report on Seed Money grant

Title: Development of a rectangular patch antenna on a 3D printed substrate for modern wireless applications

Consumable materials bought under the sanction amount Rs 1.5 Lac:

Polymers ABS, PVDF, PLA, PC
Chemical DMF
Copper tape roll
Metal Sheets
SMA F R/A edge mount connectors
Graphene powder
Thermal consumable pans

Work updations:

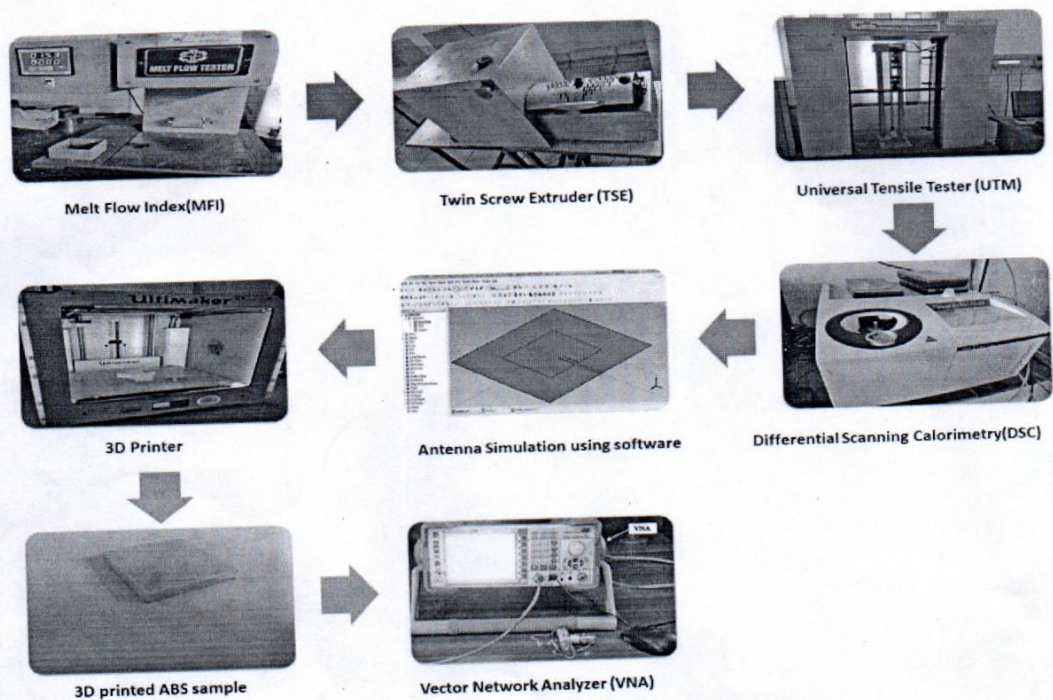


Figure 1: Process outflow of 3D printing

Material analysis of Acrylonitrile Butadiene Styrene (ABS) sample

- Rheological analysis [Melt Flow Index (MFI) calculation]



$$\tau = 9.13 \times 10^4 \text{ dynes} \quad (\text{Shear stress})$$

$$\dot{\gamma} = \frac{MFI}{\pi \times r^3 \times \rho \times 150}$$

$$\dot{\gamma} = \frac{1.83 \times MFI}{\rho} \text{ 1/s} \quad (\text{Shear rate})$$

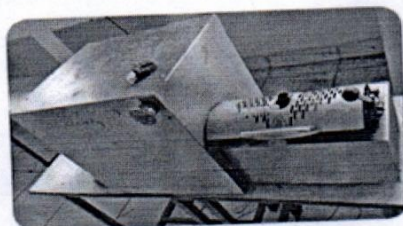
$$\mu = \frac{9.13 \times 10^4 \times L \times \rho}{1.83 \times MFI \times 10} \text{ Pa-s} \quad (\text{Viscosity})$$

S. No.	MFI (g/10min)	Density (g/cm ³)	Viscosity (Pa-s)
1.	10	1.097×10^{-3}	70930.2
2.	12.33	1.456×10^{-3}	76352.4
3.	15.3	1.457×10^{-3}	61573.3
4.	11.8	1.667×10^{-3}	42011.4
5.	10.5	1.713×10^{-3}	70548.5

- L: Test load (in kg), r: radius of piston, ρ: density
- 1 Pa = 10 dynes

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- Wire extrusion using Twin Screw Extruder



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- Process of 3D printing using the Fused Deposition Modelling (FDM) method



Ultimaker's 3D printing machine



3D printed ABS sample

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Chahal