A SYSTEM AND A METHOD FOR MANUFACTURING TRIPLY PERIODIC MINIMAL SURFACE STRUCTURE

IITM Technology Available for Licensing

Problem Statement

- In conventional ceramic forms, the density of TPMS structure of ceramic foam is less due to release of gaseous by product.
- Further, other existing methods such as direct foaming methods use the incorporation of pressured gases in the suspension of liquid media.
- And improved setup required **additional infrastructure, resources, cost & effort**.
- Another disadvantage is about the **porosity** of the types of ceramic foams which is **irregular** & **very difficult to control**.
- Therefore, there is a need for a system & method to address the above issues in efficient manner.

Technology Category/ Market

Technology: Triply Periodic Minimal Surface Structure
Industry:3D Printing;
Applications: Manufacturing Triply Periodic Minimal Surface Structure;
Market: The global **3D printers** market is projected to reach USD **5.44B** by 2030, growing at a **CAGR** of **13.5%** from 2022 to **2030**.

Technology

- Present patent claimed a **system & method** for **manufacturing triply periodic minimal surface structure**.
- Said System comprises **a fabrication unit, a casting unit, a dissolving unit, & a sintering unit.**
- **Fabrication unit** configured to convert an iso surface into a three dimensional solid design using iso-caps, & print a 3 dimensional structure. **Casting unit** configured to pour a predefined amount of ceramic slurry on the three dimensional printed structure.
- The **dissolving unit** configured to dissolve the water soluble filament fabrication material by immersing the solidified structure in water. **Sintering unit** has processed & provides a **ceramic triply periodic minimal surface structure.**(Refer figures)

Images

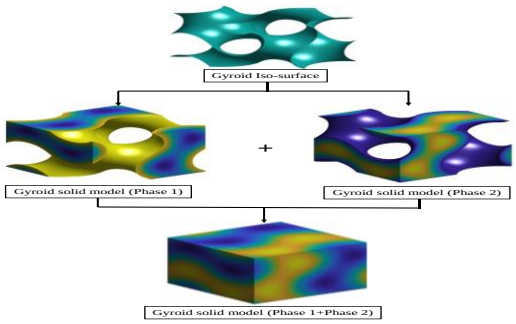

Fig.1: Illustrates a flowchart disclosing phase 1 & phase 2 results in a 3D cube-like design using gyroid TPMS;

Key Features / Value Proposition

Technical Perspective:

1. The filament fabrication material is a water-soluble filament fabrication material which comprises **polyvinyl alcohol**.
2. The dissolving unit includes **ultrasonic bath** for treating the **solidified** structure at a predefined temperature.

Industrial Perspective:

1. Provide a **cost-effective 3D printer** to print a design of the triply periodic minimal surface structure.
2. Provide a **cost-effective muffle furnace** to sinter the ceramic structure.

Intellectual Property

IITM IDF Ref. 2346 ;
Patent No: 436692 (Granted)

TRL (Technology Readiness Level)

TRL-3, Proof of Concept ready & validated

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Images (Experimental Images)

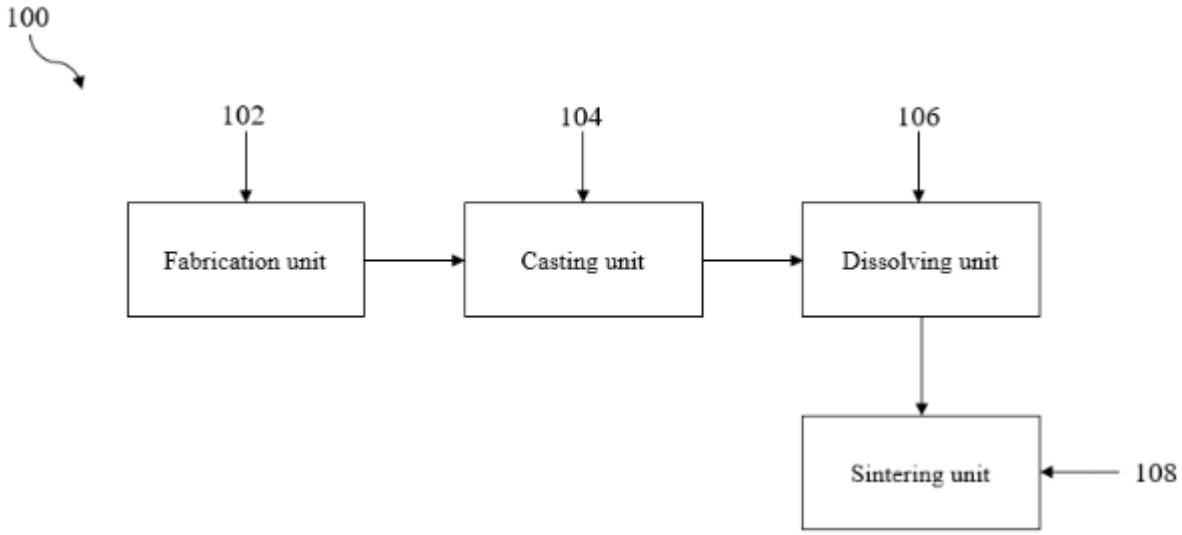

Fig.2 Illustrates a block diagram of the system for manufacturing triply periodic minimal surface structure;

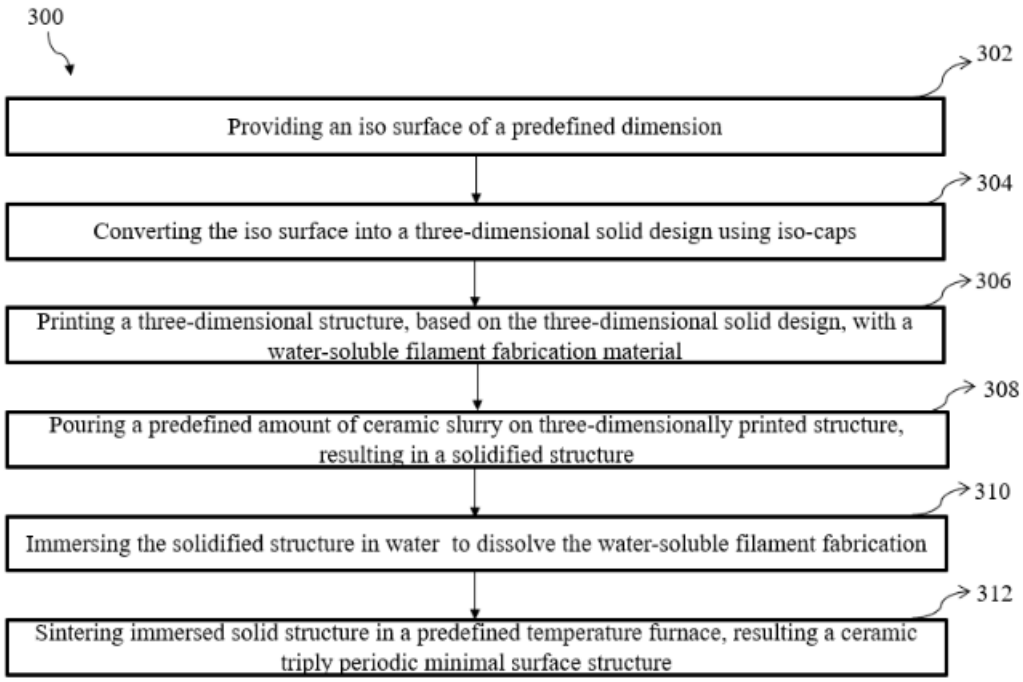

Fig. 3

Fig.3: Illustrates the steps of a method for manufacturing triply periodic minimal surface structure;

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