1.1 Project Scope

Design and build a prototype machine for infiltrating open-cell lattice structures with Sylgard 184 silicone.

1.1.1 Project Description

The objective of this project is to create a device that fills lattice structures with Sylgard 184 silicone without any air voids. The device must accommodate for variable shapes, sizes, and cavity structures. The team must validate the effectiveness of the prototype in completely filling provided lattice structures without any voids, and deliver the final prototype to AFRL.

1.1.2 Key Project Goals

The prototype must not require unreasonable ancillary equipment; one example of a reasonable ancillary device would be an electric vacuum pump. The device must be able to fill the cavities in the lattice structure with a maximum porosity of one percent. The device must be compatible with both plastic and metal printed lattices. Device must be capable of accommodating lattices of varying height.

1.1.3 Market

The primary markets for polymer infiltration of cellular lattices are the military-industrial complex, aerospace, and automotive industries where high strength/low density materials are desired.

1.1.4 Assumptions

The project scope will constrain the lattice geometries to not vary beyond the three shapes provided, see Figure 1.

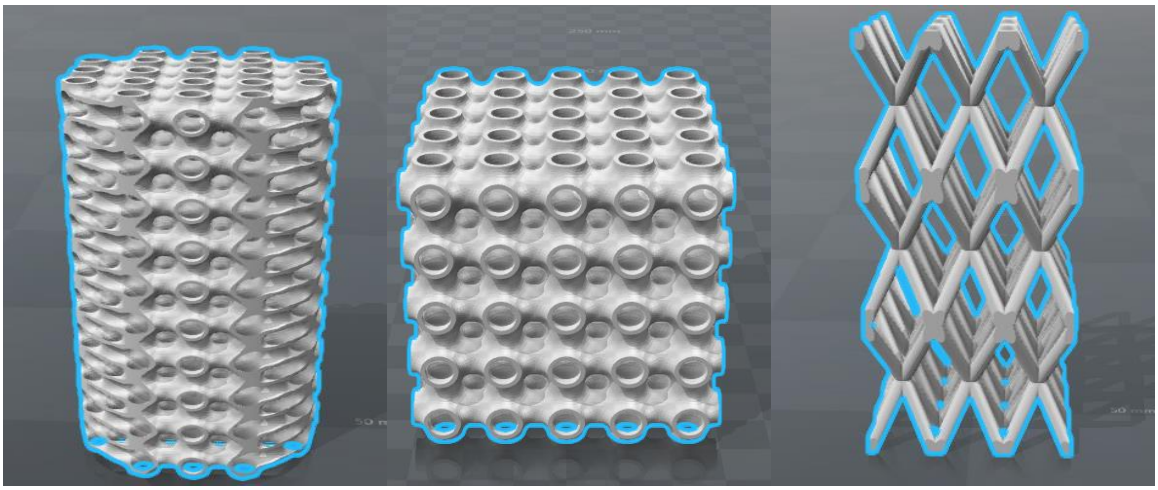

Figure 1 Three lattice designs (a) Cylinder (b) Large Cube (c) Small Cube.

The polymer used to fill these lattices will be Sylgard 184 Silicone manufactured by Dow/Corning. The silicone is assumed to be a homogenous mixture, and additional interstitial solids will not be added to the mixture.

1.1.5 Stakeholders

The primary beneficiary of the Polymer Infiltration project is the United States Air Force with Dr. Philip Flater as its representative to the FAMU-FSU College of Engineering and the design team. The FAMU-FSU College of Engineering staff providing insight and funding are Dr. Chiang Shih, Dr. Shayne McConomy and the project advisor is Dr. Eric Hellstrom.