CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Nikhil Arora

Project Number
36840

Project Title
The Comparative Strengths of 3D Printed Microlattice Materials

Abstract

Objectives/Goals
The objective was to determine which material would be the best candidate to prevent against injuries when placed in football helmets.

Methods/Materials
1.27 cm tall 2.7 cm wide cylinder of Vinyl Nitryl foam obtained from UCLA
1.27 cm tall 2.7 cm wide cylinder of 3D printed Microlattice obtained from Architected Materials
1.27 cm tall 2.7 cm wide cylinder of 3D printed Microlattice obtained from Lawrence Livermore University
Cylindrical Stencil
Instron 5966 universal test machine
Bluehill Software
Freezer

Results
Two different micro-lattice materials were compared to vinyl nitryl foam in a compression test. The Architected Materials micro-lattice had the best absorbency.

Conclusions/Discussion
The Architected Materials 3D printed micro-lattice was able to most efficiently absorb force due to its lattice like structure that allowed it to compress easily but was stiff enough to resist impact. The commercial Vinyl Nitryl foam had the second most consistent stress experienced after compressing the material but was not as efficient as the Architected Materials micro-lattice at higher strains. Finally, the Lawrence Livermore University#s 3D printed micro-lattice compressed too easily and was not stiff enough to resist force. Therefore, the Architected Materials micro-lattice was the most efficient at compressing and resisting impact.

Summary Statement
Different 3D printed materials were compared to commercial foam to see which would best prevent concussions when placed in football helmets.

Help Received
Dr. Igor De Rosa from UCLA allowed me to come to his lab in UCLA to test my materials using the Instron 5966 machine in the lab. Dr. Bamidele Ali from Architected Materials provided the donation of micro-lattice. Dr. Christopher Spadaccini donated a sample of micro-lattice from Lawrence Livermore