Tensile Behavior of Vacuum Infiltrated Fused Deposition Modeling Sandwich Structure Composites

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INTRODUCTION
Additive manufacturing (AM) is transforming the methods by which prostheses are built today. However, the strength of AM materials was identified by [1] as a major limiting factor to large scale clinical adoption. This research explores vacuum infiltration of AM composites to determine if this method is promising for increasing the ultimate tensile strength (UTS) of the AM materials, and reducing anisotropy inherent in AM materials.

RESULTS
In Figure 2 and Figure 3 we can notice that for CF-PLA and CF-PETG filament materials, creating vacuum infiltrated composites increased the transverse UTS and reduced anisotropy (especially in urethane composites.) However, due to porosity in the infiltrated samples (Figure 4), many of the mechanical properties did not reach their theoretical potential strength.

CONCLUSIONS & FUTURE WORK
Due to porosity in the manufacturing process of the AM vacuum infiltrated composites, the mechanical properties measured by these experiments are not as high as theoretically possible. However, despite these defects, we do see an increase in UTS and a reduction of anisotropy in many of our materials. These results mean that this manufacturing method is a promising technology for creating stronger prostheses with AM materials.

REFERENCES