

Nanoindentation of Additively Manufactured Ti-6Al-4V Specimens  
Presented at 2018 BMES Annual Meeting by Emily McCabe

During October 17-20th of 2018, I had the pleasure of attending the 50th Annual Biomedical Engineering Society Annual Meeting in Atlanta, GA. The conference was filled with large sessions, poster viewing, and interactive networking. I presented my research in the Undergraduate Research Session as a poster presentation on Saturday, October 20th.

My research involves the study of additively manufactured (3D printed) metals with specific interest in applying them to biomedical implants. Commonly used in biomedical implants, Ti-6Al-4V offers significant advantages over other alloys due to its mechanical strength and biocompatibility. Other metallic candidates for implantation, such as stainless steel (180-200 GPa), exceed the Young's modulus of the native bone (10-30 GPa) by a significant amount and induce stress shielding, which causes long term damage to the patient and inhibits bone healing [1]. The Young's modulus of Ti-6Al-4V (110 GPa) is closer to that of native bone, which helps to mitigate these effects. In addition to traditional manufacturing methods, additive manufacturing (AM) is being explored due to the opportunities it offers for small-scale production, customization, and real-time collaboration between engineers and health providers. With a wide variety of materials and processes currently being used, AM continues to be a promising option for the manufacturing of implants and warrants further investigation to ensure its feasibility. Nanoindentation offers specific benefits to this investigation as it can determine the modulus at a specific location and depth on the component. Ti-6Al-4V can exhibit anisotropic mechanical properties and phase variation, which makes these localized testing schemes more desirable [3.]. Nanoindentation allows for the gathering of local properties (e.g. specific facets or features) as well as porous structure's locations of interest in the future.

During my time in Atlanta I was able to meet with people whose research was the same as mine as well as discover and interesting ideas and investigate some ideas for potential graduate school research. Several presentations sparked my interest or overlapped with my research and I have benefited from the connections I have made from this conference. As a senior, it was important for me to connect with professors and students while thinking about my next steps. The faculty from Mississippi State who attended were very helpful to me in this pursuit and I learned a great deal from them. I feel as though my time spent there allowed me to build my networking skills, learn about cutting edge research in my field, and help better prepare me for the graduate school journey. I am incredibly grateful to the Shackouls Honors College at Mississippi State for not only supporting my trip financially, but also for their support of my education throughout my time at Mississippi State.