



Dr. Andrea P. Argüelles joined the Pennsylvania State University as an Assistant Professor in Engineering Science and Mechanics in 2018. She obtained her bachelor's and master's degrees in mechanical engineering from the University of Texas Rio Grande Valley in 2011 and 2012, respectively, and received her doctorate degree in Mechanical Engineering and Applied Mechanics from the University of Nebraska-Lincoln in 2016 under the supervision of Prof. Joseph A. Turner. Her interests focus on wave propagation and scattering in heterogeneous media with applications in ultrasonic testing for materials characterization. She was appointed Associate Department Head for Diversity and Inclusion in the department in 2022 and chair of the Committee to Improve Racial Diversity and Inclusivity in the Acoustical Society of America in 2023.

Ultrasound as a Nondestructive Microstructure Characterization Tool: An Integrated Experimental and Modeling Approach

Advancements in manufacturing processes such as metal 3D printing and cold sintering are closely dependent on our understanding of the resulting internal features and microstructures that dictate material behavior. Microstructure characterization is often relegated to techniques that require extensive sample sectioning and surface preparation, which are inherently limited to a small portion of the bulk material. In this presentation, I will show how elastic wave propagation methods (namely, ultrasonic testing) can be combined with physics-based models to extract microstructural parameters in fit-for-service parts. Example results are given for 3D printed metals and cold sintered ceramics where microstructure is characterized over large volumes nondestructively. These results provide clear evidence of the advantages of nondestructive characterization in optimizing manufacturing. In closing, I will provide a broader outlook for the impact these techniques may have on the development and implementation of advanced manufacturing processes at large.