

Presentation title: THERMOMECHANICAL STUDY OF METAL/THERMOPLASTIC COMPOSITES ASSEMBLIES BY LASER WELDING

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Abstract (250-300 words):

As the world actively strives for a healthier environment by reducing CO2 emissions from vehicles, the concept of recyclability and structural lightweighting has gained significant attention in transport industry. This has motivated exploration into new technologies and innovative multi-materials structures, particularly hybrids that combine thermoplastic composites and metals.

The present study focuses on multicomponent metal composite assemblies fabricated through laser welding, specifically employing a Nd:YAG laser. We delve into the technical challenges, propose innovative solutions, and emphasize the importance of robust bonding between different metallic and polymer composite materials. In this context, two methods of bonding enhancement are employed: metal surface laser texturing and polymer powder integration in the joining interface. These methods are aimed at improving bonding quality of the joint interface and the mechanical behavior of the joined structure. Additionally, we analyze optimal laser welding parameters (Laser power, welding speed, Pulse frequency, Pulse duration, Focal length, ...) to ensure peak performance, considering mechanical, quality, representativity, and reproducibility factors. A temperature monitoring strategy is also adopted to ensure precise material monitoring during the laser welding step. By doing so, we aim to provide practical insights and guidelines that can be directly applied in industrial settings, where the demand for high-performance metal composite materials continues to grow.

Recognizing the multifaceted landscape of our study, we acknowledge the imperative to delve deeper into various dimensions. This includes not only refining the process through optimization but also enhancing the overall quality and performance, while also conducting rigorous numerical analyses to ensure precision and reliability.

Biography (150-200 words):

Kh. BOUKHADRA is currently a 2nd-year PhD student. She embarked on her PhD journey following the completion of her master's degree in mechanical engineering from the Arts et Métiers Institute of Technology, HESAM university, where she honed her expertise in composite structures. Her research centers on advanced manufacturing techniques, with a particular emphasis on laser welding and composite materials. Kh. BOUKHADRA is further developing her experience and knowledge in the field of multicomponent metal composite assemblies, making significant contributions to the development of innovative solutions for robust bonding between different metallic composite materials.