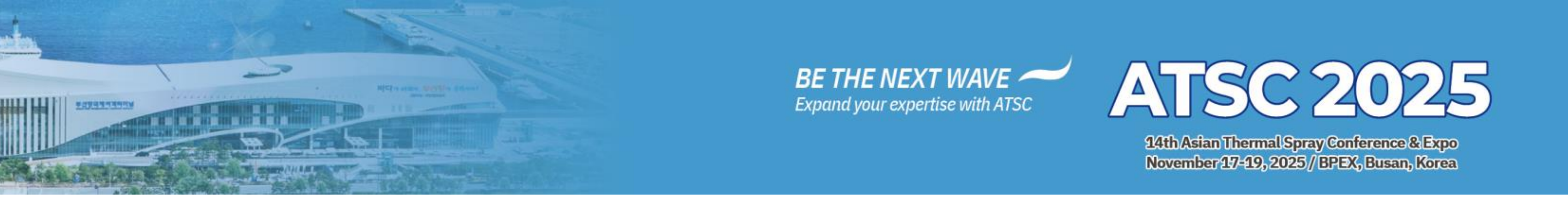

Keynote Lecture

Title	Dr.	First Name	Yuji	Last Name	Ichikawa
Affiliation			Tohoku University		
Presentation Title			Dynamics of Impact-Induced Bonding: Insights from Single-Particle Impact Experiments and Site-Specific Micromechanical Analysis		
Biography			Yuji Ichikawa is an Associate Professor at the Fracture and Reliability Research Institute, Tohoku University, where he studies mechanics of materials, interface fracture, and surface engineering, with emphasis on cold spray and impact-induced bonding. He received his Ph.D. from Tohoku University and has held visiting appointments at Mines Paris and Cornell University. His recent work integrates in situ microparticle impact testing, micromechanics, and electron microscopy to elucidate bonding and strength at metal interfaces. He served as a JST PRESTO researcher (2020–2024) and has received multiple awards from the Japan Thermal Spraying Society and the Society of Materials Science, Japan. He is a board member of the Japan Thermal Spraying Society and contributes to committees of JSME and JSMS.		
Abstract			The deposition mechanism in cold spray (CS) relies on high-velocity impact, where intense plastic deformation fractures and removes the native oxide film, exposing nascent metallic surfaces that subsequently bond. However, the extent of plastic and shear deformation is highly non-uniform, producing regions near the interface where adhesion is hindered. To address the challenges associated with such non-uniform bonding, this presentation introduces advanced mechanical approaches, including the exploration of bonding conditions through single-particle impact experiments and the nano- to micro-scale mechanical evaluation of adhesion strength. In situ microparticle impact experiments, combined with site-specific micromechanical testing, reveal the detailed micromechanics of the bonding process. Our findings demonstrate a pronounced gradient of bond strength across the interface, with		

	the maximum occurring near the periphery. This gradient is linked to localized surface opening during the early stages of impact. Transmission electron microscopy (TEM) observations further show that stronger bonding correlates with the transformation of the native oxide structure from continuous layers into fragmented debris. Metallurgical bonding is thus found to require both sufficient surface exposure through lateral expansion and high local contact pressures to achieve atomic proximity. We present a predictive framework in which bond strength is proportional to the effective pressure and degree of surface exposure, validated by finite element simulations demonstrating that increasing impact velocity enhances bond strength. This research provides critical insights for optimizing cold spray processes.