Plenary Lecture

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Presentation Title			Advanced Thermal and Kinetic Spray Technologies for Addressing Societal Challenges		
Biography			Kentaro Shinoda, Ph.D. Leader, Coatings and Interface Engineering Research Group Core Manufacturing Technology Research Institute National Institute of Advanced Industrial Science and Technology (AIST) Dr. Kentaro Shinoda received his Ph.D. in Engineering from the University of Tokyo in 2006. During his doctoral studies, he conducted research at the Centre for Advanced Coating Technologies, University of Toronto. He subsequently held postdoctoral appointments at the National Institute for Materials Science (NIMS) in Japan and at the Center for Thermal Spray Research, Stony Brook University, USA. He joined AIST in 2011 and currently leads the Coatings and Interface Engineering Research Group within the Core Manufacturing Technology Research Institute. Dr. Shinoda is the inventor of hybrid aerosol deposition (HAD), a novel ceramic coating technology advancing low-temperature processing for thermal and environmental barrier coatings and remanufacturing toward a circular economy. He has published over 58 peer-reviewed papers and holds 11 granted patents. His contributions have		

	been recognized with multiple awards, including the Best Paper Award at the International Thermal Spray Conference. He serves as Vice President of the Japan Thermal Spray Society, sits on the Editorial Board of the Journal of Thermal Spray Technology, and is also a Visiting Professor at Shibaura Institute of Technology.
Abstract	Coating technologies—particularly thermal spray and solid-state kinetic spray deposition—are gaining greater importance as global challenges become more complex in an increasingly uncertain and volatile world. Even as the COVID-19 pandemic has subsided, Japan now faces emerging issues including energy and environmental constraints, limited natural resources, a rapidly aging and shrinking population, and the need for resilient infrastructure. In parallel, competition in advanced manufacturing—such as semiconductor equipment and battery technologies—is intensifying as nations reinforce economic security. In this context, coating technologies are positioned to play a pivotal role in enabling robust, efficient, and sustainable industrial systems. This keynote will highlight three examples illustrating how thermal and kinetic spray technologies can contribute to these societal demands. First, ammonia-fueled gas turbine technology will be discussed. As hydrogen and ammonia attract attention as carbon-free energy carriers, ammonia combustion environments pose unique challenges—most notably, nitridation-driven materials degradation under reducing conditions. Understanding degradation mechanisms and exploring protective coating strategies are essential to realizing practical ammonia energy systems. Second, recent progress in solid-state kinetic spray deposition—for low-temperature repair and remanufacturing—will be presented. Processes such as aerosol deposition and cold spray offer pathways to resource-efficient, circular manufacturing by

	enabling structural restoration without high thermal loads. **Finally, advances in next-generation hybrid aerosol deposition (HAD) will be introduced. By integrating localized energy input, including laser-assisted super-temperature fields, HAD opens new opportunities for tailored microstructures and novel processing windows beyond conventional plasma-assisted approaches.** **Together, these developments underscore how coating science and technology can help build a more sustainable, resilient, and low-carbon society.**