**In-situ nondestructive testing during laser powder directed energy deposition and beyond**

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**Abstract**

Additive manufacturing (AM), also known as 3D printing, is revolutionizing how various structural components are manufactured. Laser Powder Directed energy deposition (LP-DED), which is one type of metal AM processes, utilizes a concentrated laser source and metal powders to achieve layer-by-layer deposition of materials. Although significant progresses have been made for the development of DED processes and materials, little work has been done for in-situ nondestructive testing and quality control. In this study, a suit of in-situ nondestructive testing (NDT) and process control techniques are developed, including (1) real-time melt pool depth estimation and control using coaxial infrared camera, (2) real-time porosity inspection based on transient thermoreflectance measurement using femtosecond laser, (3) in-situ mechanical properties estimation based on noncontact ultrafast ultrasonic measurement, (4) real-time porosity reduction and microstructure improvement using a repetitive Nd:YAG pulse laser, and (5) track-wise geometry monitoring using laser line scanner.

**BIO**

Hoon Sohn received his B.S. and M.S. degrees from Seoul National University, Seoul Korea and Ph.D. from Stanford University all in Civil Engineering. He worked at Los Alamos National Laboratory (LANL) as a Technical Staff Member and at Carnegie Mellon University as an Assistant Professor. He is now a Professor at KAIST (Korea Advanced Institute of Science and Technology) in South Korea. His research interest has been in the areas of structural health monitoring, nondestructive testing, sensing technologies and data analytics.  He has published over 230 refereed journal articles, over 430 conference proceedings, and 12 book & book chapters. He is holding 28 domestic and 14 international patents, and his developed technologies are licensed and commercialized by private companies, resulting in over 1.5 Million USD licensing agreements. He is currently SPIE Fellow, Member of National Academy of Engineering of Korea (NAEK), and Member of Korean Academy of Science and Technology (KAST).