MATERIALS SCIENCE AND TECHNOLOGY

DM 630/Leonardo - Simulation of Directed Energy Deposition process and material processing and chracterization

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Context of the research activity	Study of Directed Energy Deposition processes through simulative approaches with an experimental validation of models. Progetto finanziato dal PNRR a valere sul DM 630/2024 - CUP E14D24002460004
Objectives	Metallic components can be produced or repaired by Additive Manufacturing technologies, in particular by Directed Energy Deposition processes. These processes allow to produce parts with particular shape and details, being possible to add material only on the specific areas, but the processes must be deeply studied. In order to improve the knowledge and potentialities of Directed Energy Deposition processes, a deep investigation of local thermal and physical phenomena must be carried out through a simulation approach. In particular, some tools will be used for defining the correlation among the process parameters (such as laser power, scanning rate, deposition strategy, etc..), the material characteristics and the final quality in deposition components, also considering different scenarios in terms of dimensions, shape and volume. The simulations will be then validated through experimental production and characterization of samples for verifying the defined models, analysing microstructural and mechanical properties of samples produced by Directed Energy Deposition. The main research objectives of this PhD thesis includes: - Simulation of Directed Energy Deposition process - Process optimization for Directed Energy Deposition - Study of material microstructures, physical, functional and mechanical properties, defining their influence on mechanical and functional performances of samples produced by Directed Energy Deposition.

Skills and competencies for the development of the activity	Candidates should have a solid engineering background and strong motivation to learn through advanced research. Expertise in materials science, advanced processes and technologies, mechanical behavior and characterization of metallic materials is a plus. Problem solving ability and practical attitude for the design of additive manufacturing parts is also appreciated.